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National Economy

To operate efficiently, the foundry industry has to supply its customers with castings properly suited to their requirements. These requirements may be based on British Standard specifications, or special features such as pressure tightness, hardness, machineability or other physical properties. Failure to co-operate in these matters involves the transfer of patterns elsewhere. Thus, uppermost in every founder's mind is a desire to understand his customers' needs and to fulfil them. This is not peculiar to the foundry industry, but in general permeates all private industry. When industry becomes nationalised, it would seem that there is an urge to operate economically, but to do so without that necessary regard for consumer interest so characteristic of private enterprise.

Typical of this attitude is the coke-oven section of the Coal Board, for we read, in an excellent technical Paper presented to the Cheltenham Conference of the Institute of British Foundrymen by Mr. M. D. Edington, who is chairman of the Northern Section of the Coke Oven Managers' Association, the following:—" The effect on size of the higher temperature and the narrower oven should be noted and the best width and coking period for the new coke-oven installations, to be built in place of the older foundry coke ovens, is of the utmost importance to both the producer and the consumer. The capital cost of these new plants is so great that the highest possible throughputs are essential and the production of large-size coke at slow rates and from special coals is uneconomic at present prices. Under these circumstances the foundry user will be required to accept a smaller type of coke and alterations may have to be made in cupola design and practice. The only alternative seems to be an early and substantial increase in the price of large foundry coke. Experiments should, therefore, be carried out on large-scale cupola practice with the object of using smaller coke and, if this can be achieved, it will mean greater throughput at the coke ovens and cheaper coke at the foundries."

It is reasonable to suppose that the users of foundry coke know what they want, and it is not unreasonable to hazard that the changes suggested by the Coal Board will result in the production of a higher loss from scrap. Has any calculation been made to ascertain whether this potential loss in efficiency within the foundry industry will outweigh the economy sought in the production of coke? Already the deterioration in the quality of coke, through the higher ash content it is now carrying, has placed a heavy burden on foundry owners. That is not the fault of the coke makers, but is related to the poor quality of the raw coal they have had to accept. As for the lower price—the industry has, since the printing of the Paper, been subjected to a serious advance in price. The State-owned nail industry of Czechoslovakia as a means of reaching its tonnage target has been providing its foundry industry with over-long sprigs; now our ironfoundry industry is to be furnished with undersized coke. A multiplication of this type of thing will make, not for a high level of national economy, but chronic industrial headaches.

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N.P.L. Chemical Research

The Chemical Research Laboratory of the National Physical Laboratory, Teddington, was open to visitors last week. The many researches in progress included those in the group dealing with corrosion of metals. This group consists of three sections, dealing with immersed, atmospheric and micro-biological corrosion.

Researches on immersed corrosion include a study of the influence of surface finish on the corrosion rate of mild steel in aqueous solutions under conditions of rapid movement. The behaviour of low-alloy steels in static and moving conditions is also being investigated. The high-speed rotor is used for assessing the value of pretreatment of pipes prior to painting, and for evaluation of anti-corrosive paints for under-water use in industrial and marine conditions. A new electro-chemical technique has shown great promise in detecting the initial breakdown of paint coatings in immersed conditions. An improved technique for the removal from the metal base and for the subsequent manipulation of surface oxide films has been developed and is proving of great value in facilitating chemical analysis and electron diffraction examination of the films. Researches during the war brought to light the valuable corrosion-velopments of this discovery are in progress, while inhibitive properties of sodium benzoate; industrial defurther studies are going forward on the mechanism of corrosion inhibition, together with a search for other inhibitors.

Atmospheric corrosion investigations cover applications of sodium benzoate in non-immersed conditions, *e.g.*, prevention of corrosion of metal goods in transit or storage by inhibitive packages or coatings. For coating cast-iron components to prevent rusting during transit, a special rubber latex has been developed. This consists of a concentrated vulcanised latex (60 per cent. dry rubber content) containing five per cent. sodium benzoate and 0.4 per cent. sodium nitrite, the latter being calculated on the weight of dry rubber. The material is applied to the article by dipping or spraying. Another subject is the development of an accelerated test for protective coatings on steel. In one test, which has been applied to the examination of low-alloy steels, the specimens are subjected to a continuous cycle of spraying and drying, while in another, the specimens are supported by a cylindrical glass vessel fitted with heating and cooling coils so that there is a continuous deposition of moisture containing sulphur dioxide on the test surfaces.

Microbiology of sulphate-reducing bacteria and their various activities as they affect industry is under consideration. A study of their fundamental properties is in progress, including investigations of their isolation in pure culture, growth (heterotrophic and autotrophic), inhibition, morphology and enzymic constitution. The most important economic activity of the organism is their participation in the external corrosion of iron pipes in water-logged, neutral clay soils and many inquiries for advice on this problem have been received by the Laboratory. Methods of prevention are being investigated. Sulphate-reducing bacteria sometimes play a part in the internal corrosion of water mains. Other deleterious activities being studied include the pollution of water in gas-holders, coal mines, open pools and oil wells.

British Non-ferrous Metals Federation

Mr. Horace W. Clarke, D.Sc., in presenting for the fourth year in succession the annual report on the affairs of the Federation, said, in reference to the major problem of metal prices, that to-day there was no freedom in the buying of raw materials. Manufacturers were compelled to purchase from the Ministry of Supply at the price they themselves fixed—a price which was to-day some £30 a ton higher than the world price. This was a situation which caused the gravest anxiety and which the Federation was doing its best to remedy. It had, from the outset, taken the initiative in pressing the Government to reduce its price to the world level, and since the period at the end of April, when the American price began to fall rapidly, there had been two substantial reductions in the Ministry of Supply price for copper and other virgin metals. It was fair to say that these reductions were largely due to the activities of the Federation.

The Federation considered that the industry should now return to the conditions of a free market. Subject to proper safeguards and to certain modifications of the pre-war practice, along the lines discussed with the Committee of the London Metal Exchange, the Federation would welcome the early reopening of the Exchange. It recognised that in present conditions the world shortage of dollars might necessitate some special provision to prevent the undue accumulation of dollar copper in this country. The President saw no reason why provisions of this sort should not be consistent with the general resumption of a free market and the reintroduction of those "hedging" facilities which were so essential to manufacturers.

On the scientific side, the Federation had continued to give substantial support to the British Non-ferrous Metals Research Association. He was very happy that the Federation responded to the recent appeal made by the Research Association for an increase of 50 per cent. in the annual subscription.

A strong and representative productivity team had been selected to visit America, and he wished to express appreciation of the kindness and generosity of the Federation's American friends who had made such a visit possible.

The following officers were appointed for the year 1949-50:—

As *President*, Mr. William H. Henman; as *vice-Presidents*, Mr. W. J. Terry and Mr. H. E. Jackson; as *treasurer*, Mr. A. L. Johnson, M.A., and as *chairman of the executive committee*, Mr. William H. Henman.

Mechanical Properties of Some Copper-base Alloy Castings*

A Communication from the Technical Committee of the Association of Bronze and Brass Founders

(*Continued from page* 18.)

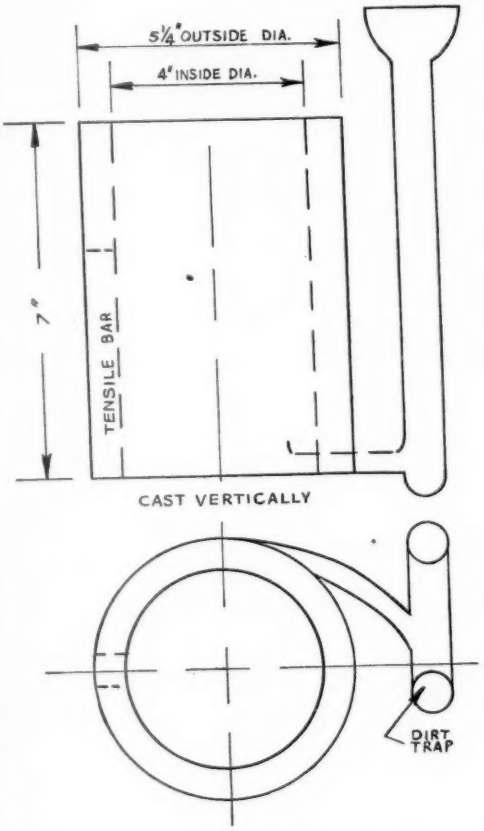


FIG. 9.—CASE NO. 6. PHOSPHOR BRONZE BUSH. CASE NO. 12. LEAD-FREE GUNMETAL BUSH.

*Presented by Mr. F. C. Evans on behalf of the Committee to the Cheltenham Conference of the Institute of British Foundrymen, June, 1949.

GROUP 2—LEAD-FREE GUNMETALS

Case No. 11

Description.—The case refers a body for 3 in. air-pressure stop-valve. It is shown in Fig. 11.

Material.—Gunmetal (88/10/2) made to conform with BSS.1400-G1-C. Its composition was:—Cu (by difference); Sn 9.8; Zn 1.85; Ni, nil; Pb 0.1; Fe 0.03 per cent.; and P, trace.

Method of casting.—Dry-sand moulding practice was used. The pouring temperature was 1100 deg. C. and the mechanical properties are shown in Table II.

Case No. 12

Description.—This case relates to bushes. They were 5¼ in. o.d. × 4 in. i.d., and 7 in. long.

Material.—Gunmetal (88/10/2) made to conform to B.S.S.1400. G.1-C.

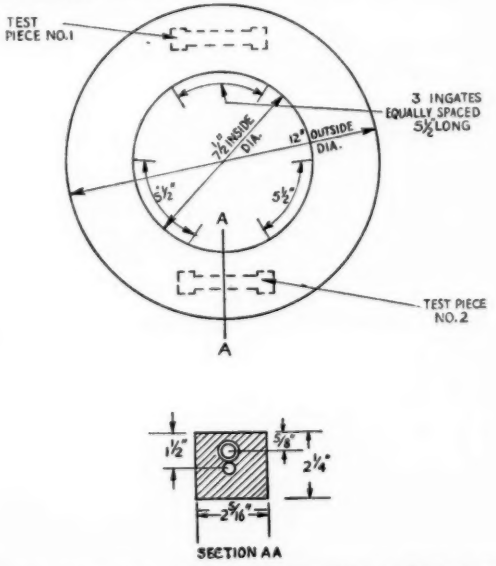


FIG. 10.—CASE NO. 7. CENTRIFUGALLY CHILL-CAST PHOSPHOR BRONZE GEAR BLANK.

Copper-base Alloy Castings

Method of casting.—For their making, green-sand moulding practice was used, but a dried oil-sand core was inserted.

Properties of sand (A.F.S. tests).—The Bromsgrove moulding-sand had an approximate moisture content of 6 per cent. The method of casting is shown in Fig. 9.

The pouring temperature was between 1160 and 1155 deg. C., and the mechanical properties are detailed in Table II.

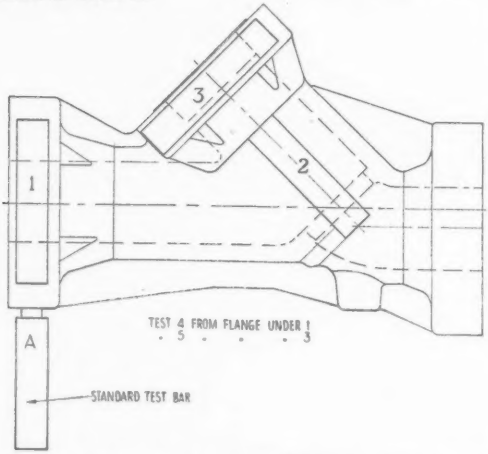


FIG. 11.—CASE NO. 11. AIR PRESSURE, 3-IN. STOP-VALVE BODY IN ADMIRALTY GUNMETAL. 18 IN. OVER-ALL.

GROUP 3—LEADED GUNMETALS
Case No. 13

Description.—The casting studied in this case was the leading, driving and trailing axle-box shown in Fig. 12. It was 11½ in. long, the outside radius was 5¼ in. with 3⅛ in. and 4¼ in. inside radii. It weighed 100 lb.

Material.—The casting was made to conform with gunmetal B.S.S.1400-LG3-C and the percentage composition was as is set out below:—

Test bar.	A.	B.	C.	D.
Cu	Balance	Balance	Balance	Balance
Sn	6.95	7.08	6.97	6.89
Pb	2.12	2.24	2.10	2.03
Zn	3.03	2.88	3.13	3.28
P	Nil	Nil	Nil	Nil
Fe	Trace	Trace	Trace	Trace
Mn	Nil	Nil	Nil	Nil
Al	Nil	Nil	Nil	Nil
Ni	Trace	Trace	Trace	Trace

The zinc contents were approximately 1 per cent. below the specification minimum.

Method of casting.—Green-sand moulding practice was used (see Fig. 12) and there was no core. Bromsgrove milled sand was the basis for the facing mixture.

The pouring temperature was 1100 deg. C. and the mechanical properties are set out in Table III.

Case No. 14

Description.—This case is the outer ring or basket shown in Fig. 13. It is 3 ft. 8½ in. diameter, with sides 1 ft. 7¼ in. deep. The wall section is 1⅜ in. thick, and it weighs 9¾ cwts.

Material.—It was cast in 83/7/5/5 gunmetal, of which the percentage composition was as is detailed below:—

Test bar No.	1.	2.	3.
Cu (by difference)	Balance	Balance	Balance
Sn	7.36	7.33	7.37
Pb	4.93	4.91	4.91
Zn	4.58	+4.53	4.58
P	Trace	Trace	Trace
Fe	0.03	0.03	0.04
Al	Nil	Nil	Nil
Mn	Nil	Nil	Nil

Method of casting.—It was cast in a dry sand mould with a dry sand core (Fig. 13), the facing sand mixture being ⅓ Bromsgrove red, and ⅔ black sand.

TABLE II.—*Lead-Free Gunmetals.*

Case No.	Type of casting.	Description of test samples.	Cast section thickness in ins.	0.5 per cent. P.S. or yield point, tons p.s.i.*	U.T.S., tons p.s.i.	Elongation, per cent.	Remarks.
11	3 in. stop valve body ..	Specification requirements B.S.S. 1400-G1-C			16	8	
		Test bar attached to casting ..			19.2	28	Standard 0·564 in. dia. test bars
		Sample No. 1	1¼		16	26	" "
		" 2	¾		15.2	30	" "
		" 3	1¼		14.6	20	" "
		" 4	1⅛		14.4	26	" "
		" 5	1¼		14.8	27	" "
12	Bush 5½ in. o.d. × 4 in. l.d. × 7 in.	Specification requirements B.S.S. 1400-G1-C			16	12	
		Separately cast test bar AGM 2		11.2*	16.6	21	Test bar 0.564 in. dia.
		Sample No. A.G.M.1	¼	11.2*	14.2	13.5	" "

* Denotes a figure for the yield point as the appropriate strain was not accurately defined.

The pouring temperature was 1150 deg. C. and the mechanical properties are detailed in Table III.

Case No. 15

Description.—This case refers to a 3-in. valve body, of approximately 6 in. diameter in the body and 9 in. over the pipe flanges. It is shown in Fig. 14.

Material.—It was cast in gunmetal conforming to B.S.S.1400-LG2-C. Its actual composition was Cu bal.

TABLE III.—*Leaded Gunmetals.*

Case No.	Type of casting.	Description of test samples.	Cast section thickness in in.	0.1 per cent. P.S., tons p.s.i.	0.5 per cent. P.S. or yield point, tons p.s.i.*	U.T.S., tons p.s.i.	Elongation, per cent.	Hardness No. (Brinell.)	Izod impact, ft. lb.	Specific gravity.	Test bar inches size.
13	Axle box brasses ..	Specification requirements, B.S.S. 1400-LG3-C				**14**	**12**				
		Separately cast test bars			8.0*	17.8	30				
		Sample No. A. ..	Approx. $1\frac{1}{2}$		8.1*	16.25	38	69			0.564 dia.
		,, B. ..	$1\frac{1}{2}$		7.75*	17.20	40	71.5			,,
		,, C. ..	$1\frac{1}{2}$		7.2*	12.00	17	71.5			,,
		,, D. ..	$1\frac{1}{2}$		7.75*	12.00	20.5	71.5			,,
14	Ring or basket casting 3 ft. $8\frac{1}{2}$ in. o.d.	Specification requirements, 83/7/5/5									
		Separately cast test bars			8.5*	17.5	30	—			
		Sample No. 1. Fig. 27	$1\frac{1}{2}$		8.25*	13.8	17	69.2			0.564 dia.
		,, 2. ,,	$1\frac{1}{2}$		8.75*	14.0	18	70.4			,,
		,, 3. ,,	$1\frac{1}{2}$		8.25*	13.9	22	68.0			,,
15	3 in. valve body ..	Specification requirements, B.S. 1400-LG2-C		(Separately cast bar)		**12**	**12**				
		Sample B	$\frac{1}{8}$			9.6	10				0.282 dia.
		,, C	$\frac{1}{8}$			8.8	9				,,
		,, D	$\frac{1}{8}$			9.9	8				,,
		,, E	$\frac{1}{8}$			8.0	8				,,
		,, F	$\frac{1}{8}$			9.5	9				0.226 dia.
		,, G	$\frac{1}{4}$			11.7	11				0.282 dia.
		,, H	$\frac{1}{4}$			11.2	11				,,
		,, I	$\frac{1}{4}$			13.8	18				0.159 dia.
		,, J	$\frac{1}{4}$			12.5	13				,,
		,, K	$\frac{1}{2}$	5.62	6.74	7.75	4.5				0.282 dia.
		,, L	$\frac{1}{2}$	5.92	7.05	8.60	5				,,
16	6 in. bore sluice valve body	Specification requirements, B.S.S. 1400-LG2-C				**12**	**12**				
		Separately cast test bar				16.7	35	On T. block Face Side			0.559 dia.
		Sample No. 1	1			9.9	10	78.9 54.7			0.562 dia.
		,, 2	1			9.8	7	76.9 58.6			,,
		,, 3	1			11.4	8	76.8 60.7			0.564 dia.
		,, 4	1			11.2	11				0.562 dia.
		,, 5	$\frac{1}{2}$			12.5	19				0.226 dia.
		,, 6	$\frac{1}{2}$			14.5	29	Outer cast Face 68			,,
		,, 7	$\frac{1}{2}$			11.3	14				,,
		,, 8	$\frac{1}{2}$			11.8	11				,,
17		Specification requirements, B.S.S. 1400-LG3-C				**14**	**12**				
		Separately cast test bars		6.7	7.95	16.3	25.5	65.5	13 : 13 : 11	8.53	0.564 dia.
	Bushes 3 in. i.d. × $5\frac{5}{8}$ in. o.d. by 11 in.	Sample No. 5	$1\frac{1}{16}$	6.0	7.12	10.7	11.5		11 : 12 : 12 2 notches only	8.28	,,
	$5\frac{1}{2}$ in. i.d. by $6\frac{5}{8}$ in. o.d. × $5\frac{1}{2}$ in.	,, 6	$\frac{11}{16}$	5.97	7.30	11.05	9.3		8 :	8.33	,,
	$4\frac{3}{8}$ in. i . by $5\frac{5}{8}$ in. o.d. × 7 dn.	,, 7	$\frac{5}{8}$	6.15	7.42	11.85	14.5		10.5 : 7.5 : 8.5	8.56	,,
	2 in. i.$\frac{1}{4}$ iby $3\frac{1}{4}$ in. o.d. × 1d. .	,, 8	$\frac{3}{4}$	6.57	7.55	13.50	20.0		11 : 10 : 7	8.38	,,
18	Pump2 iny, 7 in. dia. bod	Specification requirements, B.S.S. 1400-LG3-C				**14**	**12**				
		Separately cast bars ..		7.75	8.85	16.8	27.8	71.5	9	8.76	0.564 dia.
		Sample No. 50 (Flange)	$\frac{7}{8}$	5.9	8.0	11.5	10.0	60.9	6 : 6.5	8.5	
		,, 51 (Housing)	1	6.9	8.15	11.5	10.5	60.9	7	8.55	,,
											,,

* Denotes a figure for the yield point as the appropriate strain was not accurately defined.

Copper-base Alloy Castings

(by difference); Sn 4.15; Pb 5.55; Zn 5.34; Fe 0.16; and Ni 1.00 per cent.

The properties of the Mansfield sand (A.F.S. tests) used were:—Moisture, 4.6 per cent.; green compression, 8.0 lb. per sq. in.; and green permeability, 36.0.

The pouring temperature was 1110 deg. C. and the casting successfully withstood a 500-lb. per sq. in. pressure test. The mechanical properties are set out in Table III.

Case No. 16

Description.—This case refers to a sluice-valve body of 6 in. bore and 11 in. dia. flanges. It is shown in Fig. 15.

Material.—It was cast in Gunmetal conforming to B.S.S. 1400-LG2-C. Its actual composition being:—Cu bal. (by difference); Sn, 6.1; Pb, 3.9; Zn, 4.3; Ni, 0.5 per cent., and P, trace. The tin content was slightly above and the lead slightly below the specification maximum and minimum figures respectively.

The properties of sand used (A.F.S. tests) were:—Moisture: 6.7 per cent.; green compression, 7.0 lb. per

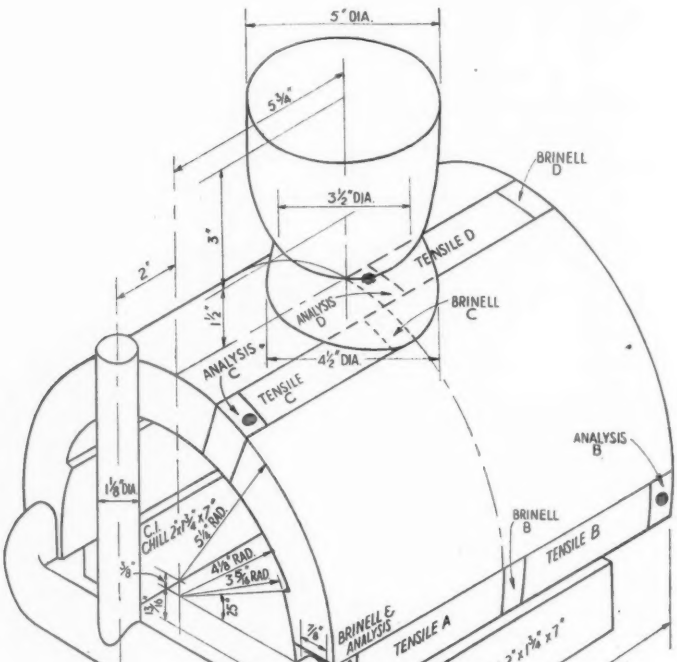


FIG. 12.—CASE NO. 13. LEADED GUNMETAL AXLE BOX BEARING.

sq. in.; green permeability: 18; dry compression: 96 lb. per sq. in., and dry permeability: 25.

A sieve test showed the following results:—2.8 per cent. retained on 30 mesh; 3.7 per cent. retained on 60 mesh; 12.6 per cent. retained on 85 mesh; 18.1 per cent. retained on 120 mesh; 35.3 per cent. retained on 200 mesh; 5.9 per cent. retained on 300 mesh; 6.2 per cent. through 300 mesh; 15.4 per cent. clay grade.

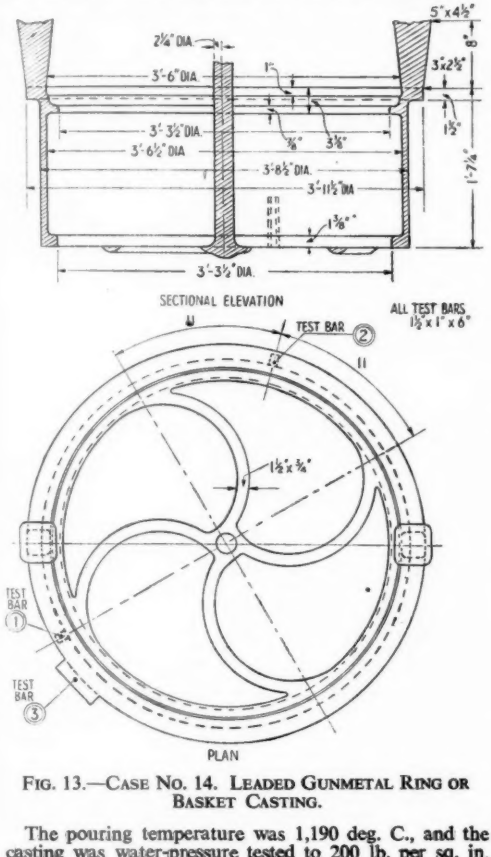


FIG. 13.—CASE NO. 14. LEADED GUNMETAL RING OR BASKET CASTING.

The pouring temperature was 1,190 deg. C., and the casting was water-pressure tested to 200 lb. per sq. in. and found to be pressure-tight.

The mechanical properties are detailed in Table III.

Case No. 17

Description.—This case refers to a series of bushes, the characteristics of which were:—(*a*) 3 in. i.d. by 5⅛ in. o.d. by 11 in., weighing 47 lb. (See Fig. 4). (*b*) 5½ in. by 6⅞ in. by 5¼ in., weighing 20¼ lb. (See Fig. 5). (*c*) 4⅛ in. by 5⅞ by 7¼ in., weighing 21¼ lb. (See Fig. 6). (*d*) 2 in. by 3½ in. by 12 in., weighing 13½ lb. (half bush). (See Fig. 7.)

Material.—Gunmetal, made to conform to B.S.S. 1400-LG3-C. The composition was: Cu, balance (by difference); Sn, 6.61; Pb, 1.79; Zn, 4.49, and P, 0.06 per cent.

Both moulds and cores were made in dry sand.

	Facing.	Backing.
Moisture	7.5 per cent.	9.0 per cent.
Green compression (lb. per sq. in.) ..	5.4 to 6.5	3.8
„ permeability	56.5 to 58.8	54.5
Dry compression (lb. per sq. in.) ..	93.5 to 102.0	16.15
„ permeability	83.5 to 91.1	69.4

The pouring temperature was between 1,120 and 1,060 deg. C., and the mechanical properties are shown in Table III.

Case No. 18

Description.—Here the pump body shown in Fig. 16 was studied. The body was approximately 7 in. dia. and 10 in. over the pipe flanges.

Material.—Cast in 85/5/5/5 Leaded Gunmetal to conform with B.S.S. 1400-LG2-C. Its actual composition was:—Cu, balance (by difference); Sn, 6.33; Pb, 5.3; Fe, 0.11; Ni, 1.32; Zn, 4.35, and P, 0.006 per cent. The tin and lead figures were slightly above the specification maxima.

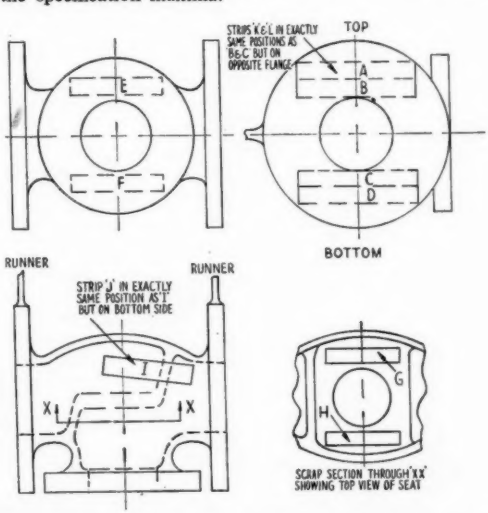


FIG. 14.—CASE NO. 15. LEADED GUNMETAL 3-IN. VALVE BODY. OVER-ALL LENGTH, 9¾ IN., BORE 3 IN. DIA.

Copper-base Alloy Castings

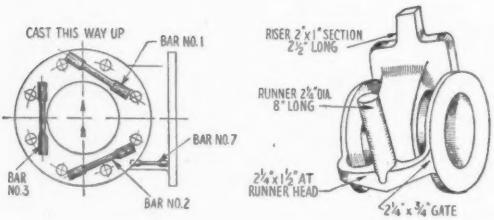


FIG. 15.—CASE NO. 16. LEADED GUNMETAL 6-IN. SLUICE VALVE BODY.

It was cast in a dry-sand mould and the properties of the sand (A.F.S. tests) used were as detailed below:

	Facing.	Backing.
Moisture	7.5 per cent.	9.0 per cent.
Green compression ..	5.4 to 6.5	3.8 lb. per sq. in.
„ permeability	56.5 to 58.8	54.5
Dry compression	93.5 to 102.0	16.15 lb. per sq. in.
„ permeability	83.5 to 91.1	69.14

The pouring temperature was 1,140 deg. C., and the mechanical properties are detailed in Table III.

(*To be continued.*)

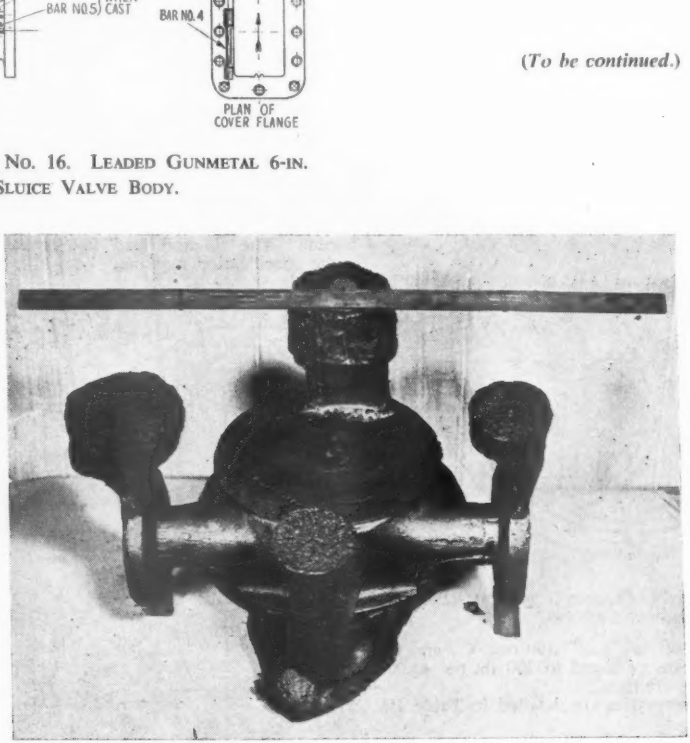


FIG. 16.—CASE NO. 18. LEADED GUNMETAL PUMP BODY. THE TEST-BAR POSITIONS ARE THE SAME AS THOSE IN FIG. 8, WHICH IS OF A SIMILAR CASTING.

Cupola Charge Materials*

Report and Recommendations of Sub-committee T.S. 27 of the Technical Council

(*Continued from page 25.*)

GUIDANCE ON USE OF STEEL SCRAP

The proportions of steel scrap which may be included in cupola charges with satisfactory results depend on the following main factors:—(1) The quantity of steel scrap available to the foundry concerned; (2) the quality of the steel scrap available; (3) the nature of the materials forming the balance of the charge; (4) the nature of the product, *e.g.*, the founding characteristics required in the metal, the mechanical properties desired in the castings, etc.; (5) whether or not alloying is effected; (6) whether or not inoculation is effected; (7) the quality and the quantity of the coke used, and (8) the standard of technical control existing or attainable in the foundry concerned.

Wherever practicable, use should be made of steel scrap in cupola charges, in order to conserve supplies of pig-iron and cast-iron scrap. Moreover, since steel scrap is a relatively cheap material its use lowers the cost of the charged metal. The quantity of scrap available may vary considerably from area to area and from foundry to foundry. Usually, the type of foundry most favourably placed is that which is part of a works using steel for other purposes and which has first call on resultant scrap. Guidance has already been given on the selection of steel scrap for cupola-melting and it should be stressed that the more ideal the physical form of the scrap the greater the proportions which can be included in the cupola charge with satisfactory results. Conversely, the less suitable the scrap the lower should be the proportions used under any otherwise standard set of conditions.

The proportion of steel scrap to be used depends to some degree on the nature of the materials forming the balance of the charge. Where the associated pig-iron is a blast-furnace product of the high-carbon, high-silicon type, the most desirable percentage of steel will be higher than in those instances in which the associated pig is of the lower-carbon type—*e.g.*, refined iron. The optimum proportion is primarily dependent on the mechanical properties required in the resultant castings. Generally, the higher the specification the greater the proportion of steel scrap required, but much depends also on whether or not alloys are used. Where unalloyed irons are produced the proportion of steel scrap necessary to achieve a given level of properties is normally greater than is the case when alloying is practised.

The normal practice for production of irons to satisfy B.S. 1452, Grades 10 and 12, or to satisfy no specification whatever, makes use of steel-free charges, the aim being to prepare a soft grey iron which will give maximum convenience in the foundry—that is with adequate fluidity and exhibiting minimum contraction—and no difficulty in machining. Nevertheless, even in such cases small proportions of steel scrap can be included with success provided that precautions are taken in accordance with the recommendations made in the following paragraphs. In foundries which produce the lightest types of grey-iron castings, however, and in which high silicon and phosphorus contents are required together with adequate carbon, the incorporation of steel scrap in any quantity is not recommended.

Enough has already been said to show the broad influence of each of the foregoing factors. The following tables are provided to give a rough guide to foundries inexperienced in the use of steel scrap or in the production of the higher-strength irons.

Table II gives guidance on the proportions of steel scrap which may be used with success for the production of the lower-strength grades, for which it is not normal to use steel scrap.

TABLE II.—*Proportions of Steel Scrap Suitable for Inclusion in Cupola Charges. Irons to Satisfy B.S. Grades* 10-12 *Inclusive.*

British Standard 1452.	Type of pig charged, shown as percentage.		
	Blast furnace.	Refined.	
Grade 10	Up to 10	Up to 10	Unalloyed
„ 12	Up to 10	Up to 10	Unalloyed
„ 14	Up to 20	Up to 10	Unalloyed

For the production of the higher strength grades inclusion of steel scrap is normal. Table III gives some guidance on the ranges usually employed.

TABLE III.—*Proportions of Steel Scrap Suitable for Inclusion in Cupola Charges. Irons to Satisfy B.S. Grades* 17-26 *Inclusive.*

British Standard 1452.	Type of pig charged, shown as percentage.		
	Blast furnace.	Refined.	
Grade 17	20 to 40	Up to 20	Unalloyed
	10 to 30	Up to 10	Alloyed
„ 20	30 to 50	10 to 30	Unalloyed
	20 to 40	Up to 20	Alloyed
„ 23	Normally necessitates use of alloys.		
	30 to 50	10 to 30	Alloyed
„ 26	Normally necessitates use of alloys.		
	40 to 60	30 to 50	Alloyed

Full discussion of the subject of inoculation would require a report to itself. Here it will be enough to stress the desirability of inoculation in all cases in which steel scrap, in any quantity, is used in the

*Presented at the Annual Meeting of the Institute of British Foundrymen, at Cheltenham, by Mr. W. W. Braidwood on behalf of the Sub-committee.

Cupola Charge Materials

cupola charges. Many materials are to-day available for the purpose, but in each case the principle is the same, namely, the late addition of a suitable graphitiser, generally, silicon-containing. This promotes the formation of normal flake graphite in random distribution and prevents the production of white irons or of grey-iron structures containing graphite of the undesirable "grain-boundary" type.

It is fairly correct to say that the higher the steel content of the cupola charge the greater is the quantity of inoculant normally required. A rough guide to the quantities recommended when ferro-silicon is used as the inoculant, is given in Table IV below:—

TABLE IV.—*Guide to Quantity of Inoculant Required.*

Percentage of steel in the cupola charge.	Suggested percentage increment of silicon.	Quantity of ferro-silicon required.	
		50 per cent. Si ferro-silicon (nearest ounce per cwt. of metal).	80 per cent. Si ferro-silicon
10	0.2	7	5
20	0.3	11	7
30	0.4	14	9
40	0.5	18	11
50	0.6	21	14
60	0.7	25	16

When inoculation is practised the final silicon content is not so critical. In computing the charges, however, the silicon calculation should allow for the expected silicon increment from the inoculant. It must never be forgotten that steel scrap is not only melted but is carburised also in the cupola. This means that some of the coke is used not for provision of heat but for supply of carbon. Normally steel scrap picks up carbon to the extent of about 2½ per cent. of its own weight. Since coke normally contains about 90 per cent. of carbon it may be calculated that for every cwt. of steel included in a charge the unit coke should be increased by:—

$$\frac{112 \times 2.5 \times 100}{100 \times 90} = 3.1 \text{ lb.}$$

In actual practice, however, it is preferable to work on the basis of 5 lb. of extra coke per cwt. of steel charged.

The quality of the coke also has a bearing on the optimum proportions of steel scrap. Cokes which are high in fixed carbon generally give hotter and higher-carbon metal. Other factors such as coke size, coke : metal ratio, bed height, melting rate, etc., all play their part, however, and it is impossible to lay down any definite ruling. The attentive user can usually determine which of his regular cokes give higher and which give lower carbon pick-up and any necessary adjustments to the charge can be made accordingly.

The final consideration governing use of steel scrap is the standard of technique existing or attainable in the foundry concerned, for: (*a*) careful, accurate preparation of the cupola charges, proper charging, intelligent operation of the cupola, close control of the tapping sequence, effective check on the chilling characteristics of the metal and efficient addition of inoculant, etc.; and (*b*) application of suitable methods of gating and feeding, to cope with the somewhat greater contraction and shrinkage generally exhibited by irons prepared from steel-mix charges, by comparison with those from steel-free charges.

In computing the charges, allowance should, of course, always be made for the low-silicon and usually moderate manganese content of steel scrap, by the inclusion of suitable high-manganese, high-silicon pig-iron or by ferro-silicon and ferro-manganese in any of their various forms, or suitable alternatives, *e.g.*, silicon steel, manganese steel. Allowance should also be made in the calculation of the charge for the greater losses of silicon and manganese by oxidation. While no hard-and-fast formula can be applied in all cases, it is usually wise to calculate on the following rough bases:—

Percentage of steel in charge.	Silicon loss. (Percentage of total charged.)	Manganese loss. (Percentage of total charged.)
Nil–10 ..	10	20
10–30 ..	15	25
30–50 ..	20	30
Over 50 ..	25	40

It is probably worth noting that, provided the cupola is properly operated with an adequate ratio of coke to metal, the higher the percentage of steel in the charge the higher will be the temperature of the tapped metal. The foundryman who makes use of steel-mix irons for the first time, or who commences use of steel-containing charges for production of ordinary grey-iron castings, is advised to check over his methods of gating and feeding. The gates may require to be somewhat larger and the feeding rather more effective. Wherever practicable, the metal should be introduced through the feeder.

Steel scrap may also be used by the indirect method of pre-melting, to yield "synthetic pig iron." This involves the use of additional fuel, but makes it possible to utilise steel scrap in maximum quantity with greater reliability. The technique is to melt charges containing 40 to 70 per cent. of steel scrap with suitable pig-iron with or without scrap, and with ferro-silicon, ferro-manganese and other alloying materials required to give the desired composition. When the final product is to contain nickel and molybdenum it is of particular advantage to incorporate these in the synthetic pig by suitable additions to the charge or to the tapped metal. There is no loss of either nickel or molybdenum on subsequent remelting.

Desulphurisation is usually necessary and this is best effected in the ladle by addition of soda ash in the proportions of up to 30 lb. per ton of iron. There is no need to skim off the soda-slag before pouring the metal neatly into suitable pig moulds, usually

stamped out on the sand bed. The slag should, however, be removed from the pigs before they are used. The use of "synthetic pig-iron," or purchased refined iron, is particularly attractive in instances in which there is insufficient capacity in the cupola well, receiver or ladle to ensure thorough mixing.

Utilisation of Swarf

Whatever be the planned method of recovery, the swarf, *i.e.*, borings, turnings, chippings, "flash," pellets, etc., should be kept as clean and as dry as possible. This requires storage under cover. Swarf stored out-of-doors, for other than short periods, sets in hard, rusted masses which are very difficult to handle. There are six methods for recovery of cast-iron swarf:—

(1) Inclusion in the burden of the blast furnace; (2) Inclusion in electric, rotary or cupola furnace charges; (3) Briquetting under pressure, for inclusion in cupola charges; (4) Briquetting by use of bonding materials, for inclusion in cupola charges; (5) Enclosing in suitable containers for inclusion in cupola charges, and (6) Incorporation, by addition of molten metal, into conglomerates for subsequent inclusion in furnace charges.

In the opinion of the Committee the most efficient is method (1) and producers or owners of swarf are recommended, wherever it is practicable to do so, to make suitable arrangements with blast-furnace operators for disposal of the material in this way.

Satisfactory methods of effecting recovery in the foundry include:—

(*a*) Melting, in the loose form, in suitable electric furnaces. This is practicable and economical in the case of specialist foundries regularly producing heavily-machined castings in alloy irons—*e.g.*, cylinder liners, etc. Melting in this way gives rise to only slight changes in composition and virtually no loss of material.

(*b*) Melting, in the loose form, in rotary furnaces, preferably those fired by pulverised anthracite and in which it is possible to prevent loss of carbon. Losses of silicon and manganese, which normally are of the order of 5 and 10 per cent. respectively, can, if desired, be made good by suitable additions, and sulphur pick-up is not great. Nevertheless, experience has shown that it is preferable to pig the resultant metal for inclusion in subsequent cupola charges rather than to use it for direct pouring of castings.

(*c*) Melting, in the loose, canistered, briquetted or conglomerated forms, in cupolas, for production of pig for remelting.

(*d*) Inclusion in cupola charges as a proportion of the charge, the resultant metal being used for direct pouring of castings. In such instances use should be made of briquetted canistered or conglomerated material only, and in no case should the proportion of swarf charged exceed 20 per cent. Other precautions, to be detailed later, are also advised.

Preparation of Briquettes

By pressure:—This requires the use of a press to exert pressure of the order of 20 tons per sq. in. and the procedure is limited, by cost considerations, to large firms handling great quantities of borings or to firms able to share in the use of a suitable press. The briquettes, which are almost invariably cylindrical in shape, should have an apparent density of at least 70 per cent. that of cast iron. Compositional changes on cupola-melting of pressure-briquetted swarf average:—

Losses.—Carbon, 15 per cent.; Silicon, 25 to 40 per cent.; Manganese, 30 to 50 per cent., with a Sulphur gain of 0.04 to 0.10 per cent. The total weight loss, including that incurred in handling the briquettes, does not normally exceed 10 per cent.

Bonding Methods

With Cement:—This procedure is likely to suit the smaller firm. The swarf is mixed with up to 10 per cent. of its own weight of cement, the mixture made suitably wet, and then allowed to set in simple moulds. Successful use of briquettes of this type, constituting 10 per cent. of the cupola charge, is reported from a textile foundry in U.S.A.

With Coal:—An interesting method (G.16), also originated in U.S.A., involves the preparation of what is, in effect, an iron-bearing coke. A mixture consisting of cast-iron swarf, 4 parts by weight, and bituminous coal, passing ¼-in. screen, 1 part by weight, was coked at 1,065 deg. C. for 1½ to 3 hours. The product had a bulk density of 125 lb. per cub. ft. and was very strong—so strong indeed that large masses were reported to be difficult to break, and it was recommended that the mixture be coked in steel boxes with cardboard separators to give the desired briquette sizes. Tests under practical operating conditions in the cupola have shown that such briquettes maintain their shape until they reach the active zone of the cupola, when the iron oozes out as droplets and the coke structure burns away. Carbon loss is virtually nil, though sulphur pick-up is high, giving 0.2 per cent. S in the tapped metal. This method would seem to have possibilities, but its application would be limited by the difficulties attending preparation of the material.

Canistered Swarf

The containers should be able to retain the swarf until the melting zone of the cupola is reached. The material should be mild steel sheet with a minimum thickness of 0.015 in., and no use should be made of canisters with soldered joints. The swarf should be firmly compacted by hand ramming or by "jolting," to give an apparent density not less than 55 per cent. that of cast iron. The borings should be securely enclosed, but the canister should not be air-tight. Canisters measuring from 4 to 6 in. in dia. and 8 to 12 in. long are probably ideal, but use should, of course, be made of any containers of suitable type such as carbide drums, paint cans, etc. This method suits the foundry which has only small quantities of swarf available, and which is unable to make other arrangements for disposal. A plentiful supply of canisters is a favourable consideration also.

Cupola Charge Materials

Average compositional changes in cupola melting, are:—

Losses:—Carbon, 20 per cent.; Silicon, 30 to 50 per cent.; Manganese, 40 to 60 per cent., with a Sulphur gain of 0.05 to 0.15 per cent. The total loss on melting is normally about 10 per cent.

Conglomerates

Several methods readily suggest themselves under this heading, the aim being to prepare a "plum pudding" in which the plums are the pieces of swarf and the pudding initially molten cast iron. As a result of experiments conducted in several foundries, however, the Committee reports that static methods, such as the pouring of excess or "dull" metal around and over swarf placed in cast iron moulds, are not practicable. A machine has been designed for the purpose.* This consists essentially of a bowl caused to rotate while at an angle of about 45 deg. This contains swarf on to which molten iron is poured. The resultant material consists of balls of solidified cast iron in which the swarf is embedded. This material is suitable for inclusion in charges for the cupola or for other types of furnace.

Cupola Melting of Briquette, Canistered or Conglomerated Swarf

When such materials are melted for production of pig they should comprise at least 70 per cent. of the charge, the balance consisting of suitable pig or scrap with or without ferro-alloys. The data already given as to probable melting losses should be used as the basis for initial calculation of the necessary adjustments in composition. The following modifications to normal procedure are recommended:—Unit metal charge, 2/3rds normal; Coke: metal ratio, 1:8 to 10; Limestone: metal ratio, 1:16 to 20. Stock height, 2/3rds normal. Blast pressure, 2/3rds normal.

Desulphurisation should be effected by treatment with about 1 per cent. of soda ash in the ladle.

When such materials are included in cupola charges intended for production of iron for direct use, the proportion of swarf charged should not exceed 10 per cent. in the case of foundries producing light castings, and 20 per cent. in foundries producing general engineering castings. Coke and limestone additions should be somewhat more generous than normal and the tapped metal should be inoculated by late addition of a suitable graphitising materia Charging of fused soda-ash blocks or desulphurisation by treatment of the molten iron where practicable, is also advantageous. In general, it may be said that the use of such material, even in the proportions quoted, will call for closer supervision of melting and tighter check—*e.g.*, by wedge or chill tests—of the characteristics of the tapped metal.

* British Patent No., 56830

Cupola-melting of Loose Swarf

Loose swarf should not be included, in any proportions, in charges for "direct" melting. Charges comprising at least 60 per cent. swarf with the balance pig or scrap and/or ferro-alloys can, however, be used with success to produce pig, provided the following precautions are observed:—

First two charges—pig and/or cast-iron scrap only.

Coke : metal ratio 1 : 6
Limestone : metal ratio 1 : 8
Silica sand : metal ratio 1 : 12

} Mix swarf, coke, limestone and sand prior to addition.

The stock height should be maintained sufficiently low to permit operation with half the normal pressure and in no circumstances should the height be more than 5 ft. above the tuyeres.

Compositional changes will average:—Losses: Carbon, 35 per cent.; silicon, 50 per cent.; manganese, 65 per cent. with a sulphur gain of 0.10 to 0.20 per cent. S. Desulphurisation by treatment with 1 to 1½ per cent. of soda ash in the ladle will reduce the sulphur content to normal levels.

Steel Swarf

This material is best used after it has been crushed or "chopped," by inclusion in electric, open-hearth, rotary or blast-furnace charges. Alternatively, it can be briquetted, unmixed, or together with cast-iron swarf, and then used in broad accordance with the guidance already given. A further suggestion is to form conglomerate material, as already described, prior to inclusion in cupola charges.

ALLOYS AND FERRO-ALLOYS

This section will be as brief as possible and no reference will be made to proprietary materials. The use of ferro-alloys has already been mentioned in discussing alternative methods of adding silicon, manganese and phosphorus. The following further points may be of value. The 75 to 85 per cent. silicon grade of ferro-silicon is more suitable for inclusion in cupola charges than the 45 to 50 per cent. silicon grade because of its better resistance to shock. There is greater convenience and uniformity of results associated with the use of briquettes though it is not claimed that additions made in this way are necessarily more efficient from the viewpoint of actual yield of silicon. For addition of silicon at the cupola spout, to effect inoculation, the use of ferro-silicon containing 75 to 85 per cent. of silicon or of silicon metal, containing about 99 per cent. of silicon, is recommended. Alloying materials should always be carefully weighed and should never be added by estimate or guess.

FUELS

Coke

There has been a general reduction in the quality of British foundry coke over the past few years. The extent of this deterioration has varied from area to

area and in general Welsh cokes have been less affected than those from other parts of the country. On the average, fixed carbon is lower by 2 to 4 per cent., ash is higher by about the same amount, sulphur is higher by about 0.2 per cent., and volatile matter is higher by about 0.5 per cent.

The last-mentioned change, though it has little direct effect, has indirect significance since it is characteristic of under-carbonised coke of lower strength, and present-day cokes are generally weaker, and less uniform in size. Coke which packs closely, *e.g.*, coke of non-uniform or unduly small size, brittle coke which shatters readily, or soft coke which sags under the cupola burden increases the resistance to the passage of air through the stock and gives rise to slower melting and lower-temperature metal. On the other hand, the use of abnormally large coke, that is, individual pieces greater than the maximum detailed in Table I, is not advisable. Such material renders the cupola conditions liable to fluctuation, causing erratic metal temperature and carbon pick-up and erratic but generally higher sulphur pick-up.

This Committee is of the opinion that there is no fully satisfactory substitute for first-class cupola coke and trusts that the powers that be will realise this and restore British cokes to normal quality as soon as possible. It is generally acknowledged that the most valuable characteristics of a cupola coke are, in order of importance:—High mechanical strength; adequacy and uniformity of size; heat value; low ash and sulphur contents; and low reactivity. While it is true to say that cupola behaviour cannot reliably be predicted from laboratory tests, it is considered that cokes with the characteristics shown would be likely to give satisfactory results.

	1st quality, per cent.	2nd quality, per cent.
Shatter index (2-in. screen) ..	90 min.	85 min.
Volatile matter	1 max.	1.5 max.
Fixed carbon	91 min.	88 min.
Sulphur	0.8 max.	1.2 max.
Ash	8 max.	10 max.

Users of present-day cokes, generally, are required to combat the effects of lower strength, erratic size, higher sulphur and higher ash, with lower heat value. The notes which follow give guidance under these headings, but inevitably many of the recommendations must be of a general nature, since conditions vary considerably from plant to plant.

Let it first be made clear, however, that not all cokes in present use are poor in quality and that careful use of good coke is of at least equal importance with judicious usage of inferior fuel. Secondly, it should be stressed that there is no advantage to be gained by the charging of coke in proportions greater than those found to give satisfactory results. Over-generous coke ratios may give slower melting and may result in the tapping of lower-temperature, higher-sulphur metal. On the other hand, it is false economy to use coke in quantities insufficient to give metal of adequate temperature and fluidity. The ideal is sufficiency without wasteful excess, and this can be ensured only by accurate, unremitting control.

In all circumstances, the following recommendations apply:—

(1) Select the best coke, of suitable and uniform size, for the bed and the "filling-up" charges. (See Table I for guidance on recommended sizes.) Note that "green-ends"—large, soft, spongy pieces of poorly-carbonised coke, and large pieces which are deeply fissured, are best regarded as potentially small coke and set aside for inclusion in the latter unit charges.

(2) Ensure that the bed is kindled thoroughly but not excessively.

(3) Check that the glowing coke bed is properly compacted before adjusting to standard height, which should be controlled by dip-rod or ball-and-chain.

(4) Establish the bed-height at an adequate level, certainly not less than 24 in. but preferably 30 in. or more above the centre-line of the top or main row of tuyeres. A cupola which is charged with too low a bed will seldom recover even with generous unit coke charges.

(5) Arrange for accurate measurement of all unit charges, the metals and fluxes by weighing, and the fuel preferably by weighing, but, alternatively, by use of a suitable measure of volume—not by multiples of a fork or shovel.

(6) Make the charging method as good as it can be from the point of view of uniform distribution of metals and fuel across the cupola. If tilt-charging is employed adopt the measures detailed later in this report.

(7) Where mechanical charging is applied it is usually advantageous to place the first charges by hand so as to minimise breakage of the coke by fall of metals.

(8) Arrange the melting programme so that individual melts are as large as is practicable. Small melts make fuel consumption heavy.

Low-strength and Small Cokes

Note particularly (1) and (7) above, and avoid all unnecessary or unduly severe handling of coke, *e.g.*, discharge from considerable height, charging first into skips and dumping metals on top, etc. Ideally, the coke pieces should be uniform in size, and preferably from 2 in. to 10 in., depending on the diameter of the cupola. (See Table I.) It must be remembered, however, that strength is most important, and it is usually better to have a smaller coke which is strong than a larger coke which is soft or brittle. Very small coke, *e.g.*, that which falls through the prongs of a coke fork of 1¼-in. gap, is best used for such purposes as core- and mould-drying, space heating, etc. An alternative method of usage which is practicable in some cases is in preheating of the cupola blast in suitable, external fireboxes (F. 11).

Cokes with Higher Ash and Lower Heat Value

Two adjustments are necessary. The first is to increase the proportions of coke charged, not only to offset the lower heat value of the fuel, but also to

Cupola Charge Materials

provide for fusion of the greater quantities of ash. It will be found, therefore, that the increase necessary in the proportions of the poorer coke is disproportionately higher than the reduction in its heat value. The second adjustment necessary is increase in the quantity or improvement in the quality of the flux. Even with these adjustments it will be found that use of greater quantities of poorer coke does not give such good results as does the use of the proper and lesser proportions of first-class coke.

Cokes Giving Higher Sulphur Pick-up

It should be pointed out that simple analysis for sulphur does not necessarily give a reliable indication of probable sulphur pick-up. It has been established that the sulphur present in the "fixed" condition is less liable to give sulphur in the metal than sulphur which is present in the volatile form. Therefore, cokes having high contents of volatile sulphur are most likely to give trouble under this heading.

It is normal for the first taps from a cupola to have relatively high sulphur contents. This is of particular concern when cokes giving high sulphur pick-up are in regular use and can be combated by the following measures:—(*a*) If suitable low-sulphur coke is also available use it for the bed and the first few charges; (*b*) adjust the charge to provide proportionately higher-than-normal manganese content in the early taps; (*c*) place a double charge of limestone on top of the bed coke; (*d*) place one or more blocks (each 4 lb.) of fused soda ash on top of the bed coke; and (*e*) wherever possible use the first tapped metal for pouring of unexacting castings.

Sulphur pick-up during the progress of the melt can be limited by avoiding the use of excess coke. At the same time, coke proportions must not be so low as to promote severely oxidising conditions in the cupola, which would increase the loss of manganese and impair the sulphur-absorbing properties of the slag. This underlines the advantage of using coke proportions which are adequate but not excessive, and stresses also the over-riding advantage of using really first-class coke. The use of oversize coke should be avoided, since it is prone to give higher sulphur pick-up.

Further limitation of sulphur content is possible by maintenance of a suitable slag, that is, one which, though adequately fluid, has a lime content not under 30 per cent. Usually such a slag is pale green to lightish grey in colour, when examined under the standard conditions detailed later. This can normally be produced by charging limestone in the proportions of 25 to 30 per cent. of the weight of the unit coke charge. An alternative procedure is to use the more normal 20 to 25 per cent. of limestone with about one-sixth its weight of fused soda ash, and a further alternative is to use about 15 per cent. of limestone with one-third its weight of fluorspar.

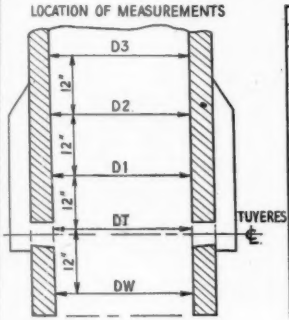
The best results are probable when a front-slagging system is used and in such manner as to maintain a good body of slag within the cupola. When the more generally used intermittent slagging practice is involved, slagging should be carried out at regular and frequent intervals. Where positive reduction of sulphur content must be effected this is normally done by addition of sodium carbonate (soda ash), in granular or powder form, to the metal in the ladle, usually in the proportions of up to 30 lb. per ton of iron, depending on the degree of desulphurisation desired. It is best added when the bottom of the ladle has just been covered by the molten metal. Any procedure which increases the contact between the soda slag and the metal, *e.g.*,

TABLE V.—*Cupola Data Covering Recommended Practice.*

Inside diameter of cupola at the melting zone	Recommended height from tuyeres to sill	Unit charges.			Air supply.			Melting rate.	Type of cast iron produced
		Coke.	Limestone.	Metals.	Volume.	Presure.			
In.	Ft.	Lb.	Lb.	Cwt.	Cu. ft./min.	Ozs.	In. W.G.	Tons per hr.	
24	12	45	9–14	4–5	950–1,200	8	13.7	2–2½	Ordinary
				2½–4				1½–2	High duty
30	14	70	14–21	6–8	1,450–1,850	9	15.5	3½–3¾	Ordinary
				4½–6				2½–3½	High duty
36	16	100	20–30	8–11	2,100–2,650	10	17.3	4½–5½	Ordinary
				6–8				3½–4½	High duty
48	18	180	36–54	16–20	3,750–4,600	12	20.9	8–9½	Ordinary
				11–16				6½–8	High duty
60	20	280	56–84	24–30	5,800–7,250	13	22.7	12½–15	Ordinary
				18–24				10–12½	High duty
72	21	400	80–120	34–42	8,550–10,500	14	24.4	18–21½	Ordinary
				24–34				14½–18	High duty

"rabbling" or "double-pouring," increases the efficiency of sulphur removal.

If the treatment can be carried out in a basic-lined vessel, sulphur removal is greatly aided. In iron-foundries, however, use is almost always made of acid linings, *viz.*, firebrick, ganister, loam or rammed sand, and care should be taken to ensure that such acidic materials as loose-sand and cupola slag are kept out of the reaction vessel. In such circumstances, using soda ash in the proportions quoted, sulphur reduction of up to 50 per cent. is obtainable. An accompanying loss of silicon up to 0.2 per cent. Si may be expected. When iron desulphurised in this way is required for direct pouring of castings it is preferable to make use of a tea-pot spout on the ladle or receiver, to ensure delivery of clean metal. The usual but less satisfactory alternative is to skim the treatment ladle. This is best done by first flowing and skimming off the bulk



LINING DIMENSIONS, INS.						
DATE	DW	DT	D1	D2	D3	
7/5	42½	40	39½	39	39	A
9/5	44½	42	46	50	51	C
"	42	41	41	40	40	A
11/5	36	35	38½	46	45	B
"	42	42	47½	47½	45	C
"	41	41	40½	40½	41	A
6/12	42½	39½	40½	41	41	A
10/12	22	26	23	43	46	B
"	45	42½	45	47	46½	C
"	43	40	40	40	41	A

A AFTER PATCHING READY FOR BLOW
B AFTER BLOW BEFORE CHIPPING
C AFTER CHIPPING BEFORE PATCHING

FIG. 3.—METHOD OF RECORDING LINING WEAR.

of the slimy soda slag and then adding granulated limestone, which absorbs the remainder to give a cindery covering which can be raked off. This is best done by use of a wooden-bladed skimmer.

Fuels Alternative to Coke

In the opinion of the Committee no serious consideration should be given to the possibility of using either gas coke or small coke nuts as cupola fuel. Moreover, from the knowledge which members have of unsuccessful experiments by others with the use of composite methods of firing, such as pulverised-coal with coke and fuel-oil with coke, it is considered that no thought should be given to such possibilities in this Report. This does not, of course, exclude the possibility of such fuels being used outside the cupola, *e.g.*, for preheating of air blast.

An alternative fuel regarding which much published information is available is anthracite coal. It is of interest to record that in the U.S. anthracite replaced charcoal as the principal cupola fuel around 1840, and for nearly half-a-century enjoyed a virtual monopoly in foundries in Eastern America. It was not until about 1900 that coke was first used as cupola fuel in that area. Recently, as the result of shortages and the poorer quality of existing cokes in the U.S., anthracite coal has been brought into re-use, as a partial replacement for coke. In Britain the present position is that anthracite is not likely to be available to the foundry industry. In the event, however, of any foundry having the opportunity to use anthracite while supplies of good coke are short, the following brief notes are provided.

The most suitable anthracites are those of the low-volatile (under 6 per cent.) hard-structured types. For best results the individual pieces should be somewhat larger than the size most suitable for coke. A foundry commencing use of anthracite is advised to introduce it first only into the later fuel charges, in the proportions of 25 to 35 per cent. of the fuel weight. Subsequently the number of anthracite-containing charges may be increased until the majority contain anthracite.

After experience has been gained and the best blast conditions and slag-forming technique have been established, further increase in the proportions of anthracite may be effected. It is recommended that replacement should not exceed 40 per cent of the unit charge when the coke size is small and 60 per cent. when it is large. Replacement should be in the ratio of from 0.85 lb. to 1 lb. of anthracite per lb. of coke. It is not recommended that anthracite should be used to replace coke in the bed or in the "filling-up" charges.

Since anthracite normally develops its maximum temperature relatively near to the tuyeres and since it is more liable than coke to softening and collapse during combustion, the use of higher blast pressure is advised, and the positive blower has advantages when anthracite is used. As the ash in anthracite is normally higher in silica and alumina and has a higher temperature of fusion than the ash of coke, correct fluxing is of increased importance and limestone should be in the proportion of 30 per cent. of the fuel or more, as judged by slag colour and fluidity, etc. Greater pick-up of carbon and more attack on the lining are usually found to accompany use of anthracite.

(To be continued.)

A New French Non-ferrous Testing Station

The Centre Technique announces the installation, due to be completed towards the end of this year, of a new non-ferrous testing station at Montreuil-sous-Bois. Located in pleasant surroundings, the laboratories will be adjoining an apprentice training school. All the Centre's laboratories and testing stations, when completed, will form a homogeneous group of technical installations well equipped to service a modern industry. Laid out as a small experimental foundry, it will contain three oil-fired milling furnaces of varying capacities, an electric furnace for light alloys, and a 20-lb. experimental apparatus. A drying stove with a capacity of 700 cub. ft. is to be installed. Advantage will be taken of the new installation to experiment with ventilation and dust reduction.

Green Core Impact Test

The core-maker is interested in the height to which a core will stand; how well overhanging parts will hold; what the effect of jolting during transport will be, and whether a cylindrical core will stand rolling out on to a plate. Whilst a standard green compression test will indicate the height to which a core will stand, new tests have been devised to more accurately reflect the other important properties.

The No. 620 green core impact tester, which we illustrate, is manufactured by the H. W. Dietert Company of Detroit, and is designed to make these new tests. The crank is turned by hand and each revolution is shown on a counter. On the end of a shaft to which the crank is connected is a cam which raises the plunger of the impact tester 0.080 in. and allows it to fall against the anvil base. The number of jolts required to crack a core is a measure of the ability of a core mixture to be rolled on to a plate. Overhang possibilities are measured by jolting a test core formed with an overhang. A dial indicator measures the slump suffered by a core when subjected to a standard jolt. These new tests are expected to be

a valuable aid in designing and controlling core mixtures to do their job effectively, but unfortunately the machine is not yet available in Great Britain.

Latest Foundry Statistics

Employment in foundries again shows a reduction, according to the July Bulletin of the British Iron and Steel Federation. The average number of persons employed in ironfounding on April 9 was 148,766, whilst on May 7 the figure was 147,776—a decrease of 990. In steelfounding, the reduction was 61, the corresponding figures being 19,593 and 19,532, but in this case there was an increase of nine men, so the loss was entirely on the distaff side which reverses the figures in ironfounding, where the loss of men was 1,059. The steel melted for the making of steel castings was, during May, running at a weekly average of 8,800 tons, as against 7,900 tons in April and May of last year. The weekly average deliveries were also slightly higher at 3,500 tons.

HARBOROUGH CONSTRUCTION COMPANY, LIMITED, Market Harborough, Leicestershire, is closing its works from July 23 to August 1, inclusive, for the annual vacation.

Making the Foundry More Attractive

Trends of Opinion Amongst Scottish Foundrymen

Compiled by R. O. Patterson

A Competition for the best Paper on this subject was organised by the Scottish Branch of the Institute of British Foundrymen. A prize was offered by a foundry owner, who wished to remain anonymous. The first prize was awarded to Mr. J. G. Nesbit, and two other competitors, Mr. J. Meek and Mr. W. Graham, tied for second place. This complete report was compiled to embody the best suggestions from all the Papers, and was read to the Branch by Mr. A. Marshall.

Reviewing the Papers submitted in the recent competition it would appear that suggestions for "making the foundry more attractive" might be classified under the following broad headings:—

(1) Physical appearance and comfort of the foundry;
(2) Mental attitude to the work.

It is impossible, however, really to separate these two themes as each is bound up with the other. Most of the writers seem to have recognised this, along with the fact that any improvement in either direction would undoubtedly bring about greater contentment and happiness for the foundry employee and a consequent improvement in production and efficiency, to say nothing of attracting the number of young apprentices the foundry urgently requires.

While it may not always be true that "the onlooker sees most of the game," the newcomer to the foundry tends to be repelled at once by conditions which the veteran foundryman has grown to accept as normal. This phase is referred to by a number of competitors. One of the main factors which defeat the appeal of craftsmanship is referred to by one competitor who writes as follows:—

"We admit the appeal is there, the scope for creation very large, and opportunity for devotion to craft. A boy leaves school instilled by our education system with the choice and variety of occupations available—he knows of the marvels of science and engineering—and he seeks employment with two main thoughts in his head: a job that will prove interesting and give good reward. He has no sooner entered into the foundry, however, than he commences to develop a deplorable lack of interest, and he never feels he is paid enough money for the drudgery he has to go through. It is my contention that the root cause of this condition is due to the method adopted by most foundries in the training of apprentices."

An interesting, practical effort to stress the value of what the "popular-science" writer would call the "romance of foundrywork" is made in one Paper, as follows:—

"The problem which faces us to-day is one which is affecting the whole industry of the country, not only in the foundry, but wherever manual labour is involved. The annual report for this year of the General Federation of Trade Unions states that the popular urge to escape from hard labour in the basic and creative industries has dangerously altered Britain's education policy, and that this anti-industrial psychology is sponsored by the Education Authorities and fostered in nearly every home.

"If this be true, then it appears that the very thing we are trying to get, that is, education, is the very thing that is preventing us from achieving our object. The boy of to-day believes that his education lifts him above the foundry, while we want his education in the foundry. For a number of years, chemists and highly-skilled engineers have been taking a very active part in foundrywork. They have found something that has a fight in it, something that demands all their education, something that seems beyond them. It is a fight against nature.

Medical Comparison

"The foundry student is not unlike the medical student. He has to deal with temperatures, strains, fractures, scabs, hot spots and other skin diseases, bad feeding, internal disorders, and porosity which is the cancer of the foundry. He has also the X-ray in constant use. The medical student has to learn the construction of the human body and the nature of all its component parts and how they react under certain treatments. The doctors believe that the first step to health is cleanliness. The same rule is applicable to the foundry. We must do a bit of cleaning up—it will make us healthier. Let us sweep away anything that is not desirable and introduce something that is attractive. We cannot say that moulders in the past were trained in such a manner as to enable them to understand all that is involved in the production of sound castings. The future foundryman must not be left in this condition. He must be in possession of the necessary knowledge that foundry craftsmanship demands. We must prepare or repair the foundry, advertise and get the right type of boy, have a proper method of training with education and recreation."

It seems reasonable to infer, from those writers who have stressed the need for improving the physical appearance and comfort of the foundry itself, that while good education and sound training are undoubtedly essential to efficient foundrywork, the value of such knowledge and enthusiastic pride can be considerably negatived by dirty, untidy, gloomy and depressing surroundings. There is no need to be a psychologist to know that such negative factors can be just as serious handicaps to efficient production as faulty machinery or bad organisation. One competitor makes a practical

Making the Foundry More Attractive

attempt at suggesting a first step towards bringing about an improvement in both directions at one and the same time, for, although he has stressed that his prime object is an educational one, his proposed model foundry might well serve the double purpose. He writes thus:

"Most educational schemes are promoted by individual firms, sometimes in conjunction with a technical college, the ultimate aim being the provision of future craftsmen for the particular firm. I don't think there are many small firms who can afford a training scheme such as they would like to have, and I feel there is a great need for some co-operative scheme whereby firms of all sizes would benefit by participation in it. Other trades have given us a lead in this respect and we are already familiar with the "model coal mine," and the "model dairy farm." so why not a "model foundry?"

The writer goes on to describe the lay-out, etc., of his suggested model foundry in detail, and concludes by proposing "an enterprise foundry exhibition to tour the country and which would incorporate some of the ideas of a model foundry."

An existing establishment which might also be described as a model foundry, though in a rather different sense, is mentioned by another writer in dealing with the advantages to be gained from effecting physical improvements in the foundry. He writes thus:

"The difference in conditions between two particular foundries can be given as an example. These two foundries are situated some distance apart but controlled by the same company. One is a part of the main engineering shops and is a jobbing, time-serving shop dealing with medium-to-large-size castings, and, although it is well equipped and designed, over a period of some years the system has been varied for various reasons, giving it a rather topsy-turvy look. The other foundry is mechanised, dealing with small to medium castings; the building is all glass, the floor is of concrete, there is fluorescent lighting, and the lay-out from core-shop to fettling shop is orderly, giving an impression of steady production flow. Outside is clean and tidy, with well kept tree- and shrub-studded lawns.

"Both foundries have excellent wash-up, toilet and canteen facilities which are made use of to quite a large degree, although not as much as intended. Whilst the jobbing shop finds difficulty in recruiting labour, especially apprentices, the mechanised shop, which is not "time-serving," has no trouble at all in getting men and boys, yet the wages are approximately the same in both shops, and an incentive bonus system is in operation in each."

Improved Methods

Existing physical foundry conditions and a general idea of possible methods of improvement are typified in the following extracts from competitors' Papers:—

"The first, and probably one of the main drawbacks in all foundries, is the dirt, dust, bad light and general uncongenial atmosphere that seems to hang about the place. Foundries generally in most parts of the country are dirty, draughty and dark. Windows or roof lights are obscured with grime, the walls blackened with fine dust, and the floor uneven with a depressing amount of litter strewn about. Such a picture is not at all likely to attract recruits, and reflects badly on the management which allows it to exist.

"Much can be done in 'good housekeeping' by clearing accumulations of broken boxes, core grids, hangers and general junk which always seem to pile up in corners. This also applies to the fettling shop, where getting rid of burnt sand, core-wires, hangers, scrap, etc., would effect great improvement.

"Plated or concreted roadways should be laid down to suit the work of the shop and those roads should be kept clear and free from all rubbish or other material at all times. A straight, clean pathway in the shop not only facilitates the handling of material, but at once gives a tidy and workmanlike appearance to the place, and, as it is the first impression that often is the most important, the appearance of a clean shop goes a long way towards making sure that that impression is good. It is a simple step to take, lasts long and will pay dividends. Yet in how many shops is it neglected?

"The floor should be kept clear of everything but the work actually proceeding. It should be kept level and renewed from time to time with fresh, clean sand. No doubt the best floor in a fully mechanised foundry would be of concrete. Usable sand would be in bins or hoppers above the machines, unusable or worked sand would be dumped on conveyors and sent to the reconditioning plant. Sand reconditioning should not be carried out in the foundry; it should be done in a separate building, where the dust inseparable from the operation could be controlled and disposed of.

Advantage of Dust Extractors

"Unfortunately, foundries and fettling shops are difficult to keep free from fumes and dust without expensive installations, but there is no doubt that dust extractors situated over knock-outs, sand plants and fettling-shop grinders are advantageous.

"Some form of heating is called for, instead of open fires placed in various parts of the foundry which cause so much dirt and ashes. In the moulding shop, drying stoves can be constructed which do not give off volumes of sulphur-laden fumes. Moulding boxes and moulds on being extracted from the drying ovens are covered with soot and fine ash and have to be cleaned. Invariably the deposits are blown into the shop. The handling of those boxes is an objectionable job. Fine deposits, such as carbon, ash and dust, must be taken care of in a separate section of the foundry whenever possible, but it would be much preferable to prevent their appearance altogether.

"Superior substitutes for coal dust, blacking, plumbago and parting powders are possible. A suitable refractory paint can replace all these materials if properly applied. There is in existence one such paint which when applied to the mould face assumes the characteristics of a facing sand and refractory wash, and indeed introduces superior stripping qualities to any other known refractory. Metal and other patterns coated with this paint render unnecessary the use of parting powders. No fumes or objectionable odours appear when the paint is used and the gases evolved are extremely inflammable and ignite immediately.

"Disposal of spare or excess metal should be orderly, and not just poured out on a roughly-made sand bed, to be subsequently laboriously broken-up. A row of small ingot moulds, conveniently shaped, into which the metal can be poured and which are fitted with stands and trunnions so that the ingots can easily be tipped out, will save an immense amount of labour. Such ingots are clean, easily handled or stored, and infinitely preferable to the ragged, dirty pieces of metal from the sand bed.

"There should be recognised gangways laid with cement or other hard material, and these should be kept clean and swept twice or thrice daily. A good plan would be to cement the floor to a width of about eighteen inches from the wall all round the shop in the form of curb standing about four inches above the general level. This 'pavement' could be kept clean and tidy and the men should be required not to place rammers or shovels against the girders or walls. Lock-up boxes could be provided for the storing of such articles after their collection by a labourer each night. These shovels and rammers, etc., could all be marked and replaced in their respective places ready for the moulders when they arrived in the morning.

"Ball-cock feed-controlled water tanks should be installed, instead of various tanks and tubs where the tap is often left on and the surrounding floor becomes soaking wet. . . . It would be a good idea if all forms of malicious damage, or even the throwing of litter about the shop, were severely dealt with by the management.

"The outside surroundings of the foundry could also be tidied up, especially where it faces a road or railway, as a pleasant approach first thing in the morning has a good psychological effect on employees or on any prospective recruit. As an exaggerated example of attractiveness there are the advertisement pictures of the factories of various chocolate manufacturers! If a foundry initially is clean, tidy and bright, employees do not usually need urging to keep it so."

Ventilating and Heating

The improvement of ventilating and heating methods is also discussed in several Papers, of which the following quotations are examples:

"Suction fans should be placed at the most suitable spots along the roof, and windows around the shop should be fixed so that they can be opened or shut as conditions require. This not only helps to control the fumes but also the temperature of the shop."

"In cold weather, moulding materials can be very uncomfortable to work with, if the shop be not properly heated. Hot-air circulatory systems are better than those of the static types where most of the heat goes up to the roof. However, anything is better than the commonly-used and unhealthy coke braziers. Conversely, in hot weather, circulatory systems will keep the place cool and minimise fumes."

So far we have gone only halfway towards clearing and brightening the atmosphere of the foundry, for the maximum value to be derived from banishing the dirt, dust and fumes can be realised only in conjunction with the operation of full and proper lighting facilities. Nor have the writers forgotten this vital point.

"Foundry buildings could be brightened considerably by making maximum use of daylight and artificial lighting. While an all-glass shop is likely to be too warm in summer and the opposite in winter, there should be, nevertheless, sufficient *clean* glass to admit as much daylight as possible. When one thinks of the brilliance of some machine shops, it is a shame that moulders have so often to contend with dingy, gloomy and badly-lit surroundings."

"The use of ribbed glass for roof lighting has the advantage of providing a good intensity of diffused lighting and obviates glare and deep shadows."

Black Windows

"Why firms prefer to pay for artificial lighting when good daylight is better and cheaper is something beyond understanding. Windows in a foundry are, more often than not, black with the dirt of years; they let in only about twenty per cent. of the light they were designed to admit, and on the whole give one the impression of some dark and gloomy dungeon into which good daylight must on no account be allowed to enter. If they can't be kept clean, why have them at all? Be frank and do away with them and let us go back to the caves we came from and work as honest troglydites—for that is what we look like in many foundries! Why is it that, in most shops, windows cannot be opened? In the heat of the summer a moulder may heave a brick through one to let in some air, and in the winter he stuffs a bit of sacking in the hole to keep out the wet and cold. This is not only inefficient but is uncomfortable to all concerned and again gives a bad impression to the newcomer."

"Proper illumination creates a brighter shop and gives better production."

"Artificial lighting depends on the type of work, and in most foundries 14 to 20 candle-power is the average, and must be so distributed as to prevent glare or bright or dark patches which cause eyestrain and fatigue. Some processes may require special light colours, as in the inspection of screw threads in castings, and this is facilitated by the use of mercury-vapour lights. With aluminium castings, surface defects, such as pin holes, etc., are easily spotted under the blue mercury-vapour lamp. On the whole, the various colours used serve a double purpose since they also present a pleasing appearance and relieve drab surroundings."

"As most craftsmen fail to get the maximum of light direct into the mould, when finishing a job, they use small paraffin lamps which give off heavy fumes and are odorous and detrimental to health and a cause of eye strain. The management can help here by making wider uses of electricity, and a little ingenuity could produce an extension light much on the same lines as the household standard lamp which could be raised or lowered to any level suitable to the particular job on hand."

"Thoughtfully positioned fluorescent lamps with screened dust-proof shades are a great improvement on grimy, shaded and unprotected single bulbs, the light of which is more often than not shadowed by structural framework or which may be intermittently blotted out by passing cranes."

(*To be continued.*)

Alterations in the Factories Act

By F. J. Tebbutt

The Factories Act, 1948, is a measure which makes various alterations in the principal Act, the Factories Act, 1937, and brings the matters dealt with into conformity with modern conditions.

Certificates of Fitness

Under the 1937 Act, a young person, if under 16 years (for these Acts a young person, male or female, is one under 18 years), was required to be medically examined, and to secure a Certificate of Fitness, before factory work could be properly undertaken. Now, by this 1948 Act, the position is that this requirement is to apply to all persons if under 18 years of age. Work can be started before such examination, but within seven days the employer must notify the appointed factory doctor that a young person has started factory employment, and such employment cannot continue for more than 14 days without a "certificate of fitness." Yearly inspections are now obligatory, and a factory doctor can revoke or vary a certificate at any time and can include conditions; formerly there was no yearly requirement, but a certificate could be subject to a re-examination after an interval.

By the 1937 Act, doctors were called "examining surgeons"; now they are by the 1948 Act called "appointed factory doctors." Appointments are made by the Chief Factory Inspector or a divisional superintending inspector in some cases.

Factory Premises

There have always been certain powers to deal with unsuitable premises and this Act now gives additional powers so that the provision of the Act is that a court of summary jurisdiction, if satisfied on a complaint by the factory inspector that a factory (or part) is in such a condition or is so constructed or placed that any process or work carried on or intended to be carried on, cannot be executed with due regard to the safety, health and welfare of the persons employed, can prohibit the use of the premises for that process or work. The old provisions, really, were applied if there was risk of bodily injury to employees. Under this new Act, the court can stop the use of premises already being used for any process or work and also prevent the use of premises intended to be used as a factory, if considered unsuitable from the point of view of the safety, health or welfare of the employee. Thus, arising from the new provisions, the carrying on of any process or work can be either prohibited indefinitely or until steps have been taken to bring the factory into line with the requirements of the Acts. Moreover, as regards premises intended to be used, the court can make an order if, apart from the question of health, etc., outlined above, they are satisfied that the work could not be done without a contravention of the principal Act or a Regulation or Order. A point to note is that under the old Act a person could start a factory before notifying the Inspector; particulars could be given within one month. Now, notification to the Inspector is required, not less than one month before, and the Inspector can inspect the factory before it starts work.

Sundry Matters

Certain powers given by the 1937 Act as regards standards (*e.g.*, temperatures and ventilation of workrooms, etc.) have been clarified, so that, although a standard is laid down (*e.g.*, temperature 60 deg. F.), there can be departures from the rules in certain cases.

Power is given for health and safety regulations to be made, not only in respect of manufacturing processes or plant used in them, but also to any other dangerous equipment, not ordinarily used in the process (*e.g.*, fire extinguishers which may give off fumes). An Inspector can take samples for analysis of substances in use or for use, likely to prove dangerous to the health or safety of employees, only (as under the old Act) if he suspects a contravention of a Regulation. Now, he can take appropriate steps in relation to any substance which he thinks may prove on analysis to be likely to cause bodily injury to the employees.

Certain safety provisions of the 1937 Act concerning lifts, boilers, constructions and maintenance of floors, passages, and stairs, lighting, etc., are now made to apply to parts of premises used as a factory, but not actually in a factory, as example, composite premises which may be partly used otherwise as shops, residences, etc.

The provision of the 1937 Act which requires seating facilities to be provided for female employees where the work is done standing has been amplified, so that seating facilities must be provided for all employees irrespective of sex in certain circumstances. That is, where an employee has reasonable opportunities for seating without detriment to his work. This new provision, however, is not to operate until October 1, 1950, the postponed date being on account of the difficulty of obtaining suitable seats and, possibly, the time for rearrangement of gangways, working arrangements and so forth.

If it appears that there may be risk of injury to health of the employees from any substance or materials brought to the factory to be used or handled or from any change in the conditions of work in the factory, special regulations can be made as to the medical supervision of the employees. This applies to persons of any age and is in addition to a section of the 1937 Act, which gives similar powers as regards illness or risk of injury to employees through the nature of a process or use of a new process or substance.

A GROUP OF FORTY-SIX Norwegian civil engineering students from the technical university at Trondheim has recently spent a fortnight in Scotland and the north of England viewing major engineering installations—roads, bridges, waterworks, power stations and the like. They were accompanied by Prof. O. D. Laerum, who occupies the chair of Professor of Roads and Railway Construction at the university.

Present-day Trends in Runner Practice*

By J. F. Measures

The methods of running castings to-day are somewhat like ladies' fashions, what is the last word to-day is almost out of date to-morrow, and a few moments spent on "The New Look" are perhaps not out of place. These remarks are primarily concerned with runners used on medium-weight machine-moulded grey-iron castings, and perhaps to a lesser degree might be used successfully on larger castings.

Functions of a Runner

First, to consider briefly what a runner has to do. Its duty is to fill the mould with molten metal at a predetermined speed and in such a manner that impurities are not able to enter at the same time. It must be placed in such a position in relation to the casting so that little or no turbulence takes place during the process, and also arranged in such a manner that once any part of the mould comes into contact with the metal that part is quickly covered, and, lastly, the point where the metal enters the mould should be such that a uniform rate of cooling is obtained.

It is well known that with the varied designs and unequal sections of the modern casting, any single type of runner will by no means meet all requirements, so here are considered one or two types that may be usefully employed with modern designs and at the same time give a reasonable chance of producing a perfect casting. They should be readily applicable to moulds made on a moulding machine, using a squeeze head. In other words, runners using downrights that have to be tube cut.

Perhaps the nearest approach to the perfect runner is the "Connor" or "block" runner. This runner having been previously discussed before our branch, it is not proposed to enlarge upon its construction; but it is necessary to point out that it lends itself very admirably to all methods of machine moulding, and at the same time combines clean pouring and feeding qualities with the minimum amount of fettling. This form of runner is far in advance of most of the old methods such as the spinner knob, etc.

There still is the simple straightforward single ingate, connected to a tube-cut downright by a topgate, and provided this topgate extends well beyond the ingate and at the same time both topgate and downright are larger in area than the ingate at its smallest point, a sound casting of the simplest type is almost invariably assured.

Multi-ingate Runner

A fairly recent introduction in runner design is the distributed or multi-ingate type of runner. This form of runner is no doubt an off-shoot of the type previously mentioned, but by the mere fact that the metal enters the mould simultaneously at so many equally distributed places many advantages are to be gained. It will readily be seen that by employing many very small ingates, it becomes almost impossible for impurities to enter the casting, and at the same time eliminates any risk of causing a hot spot which often occurs when a single ingate is used.

Spring-loaded Downright for Machine Moulding

It will be noted that all three type of runners already mentioned require a runner bush, but should this be considered unnecessary, the range will be completed with a runner ideal for the lighter castings. This comprises a plain downright connected to the topgate and ingate, thus being a part of the pattern-plate set-up, and with the downright opened out at the top to form a cup or runner basin. This downright or runner basin can be easily formed by the use of a spring-loaded runner peg. This peg is shaped at the top to the size and shape of the basin required.

To operate this type of runner a hole equal in diameter to the downright, plus a small clearance, is drilled through the pattern plate at the end of the topgate, the runner peg is inserted into the hole and rests on a plate or platform below the pattern plate. The overall length of peg plus the cup should be equal to that of the moulding-box depth, plus the sand frame. To work this runner, place the peg through the hole in the pattern plate, the moulding box is then put into position and filled with sand and squeezed to the level of the box, the runner being taken down by the squeeze head and at the same time compressing the spring. When the head is removed the runner jumps back to its original position, leaving a perfectly-formed downright and runner cup.

The position of the runner in relation to the casting is a factor that cannot be overlooked, especially when a single ingate is being used. The stream of incoming metal must be kept clear of cods, etc., also any jet action must be avoided, and the bottom of the mould must be quickly covered. This can often be done by running the casting under a core. This practice often makes it possible for the ingate to enter the mould some considerable distance below the joint line, a distinct advantage, particularly where a very deep job is being made. Thus, one can eliminate metal turbulence and the risk of mould wash. The runner position used with the "Connor" or "block" runner must be at the highest point of the casting, and although this practice directly cuts across all that has been said about previous runners, the fact remains that it works, and a personal opinion is that it is the greatest step forward in runner construction for many years.

To sum up, too much care and attention cannot be paid to how and where a casting is to be run, and furthermore, if one were to analyse carefully the scrap castings produced in the foundry over a period, it is reasonably certain that many would have been saved had they been run with the correct type of runner and in the correct place.

*Entry for a Short Paper Competition organised by the East Midlands Branch of the Institute of British Foundrymen.

Publications Received

Das Eisenhändler Fach Blatt. Published by Erwin Gansell Verlag, 20a, Lehmberg, Kiel 20a, Germany. Temporary price, 8.75 marks a quarter.

Two issues of this fortnightly magazine serving the interests of the ironmongers have been received. The reviewer found perusal quite interesting, as the contents, especially the advertisements, show the current design of cookers, lawn mowers, mincers and many other products of the foundry. There is an illustration of a hand machine, which looks like a lawn mower, but carries a central gap. Actually it is for churning-up and rolling the soil on either side of a row of young plants, removing weeds, and the like, in the process. Having done this, the makers continue the good work by advertising a gadget which encircles each small plant with a ring of anti-snail powder.

A Dictionary of Metallography, by R. T. Rolfe. 2nd edition. Published by Chapman & Hall, Limited, 37, Essex Street, London, W.C.2. Price 10s. net.

The first edition of this work received marked approbation in a review published in the FOUNDRY TRADE JOURNAL. The good impression then received has been amply confirmed by a perusal of this second edition. The new additions and re-definitions are alike entirely satisfactory. It should be pointed out, however, that a better title would have been "metallurgy," for after all metallography does give to the technician the idea of pictures of metals [as revealed by the microscope], whereas metallurgy is mentally related to the performance of a number of operations. Thus it is really in connection with the latter and the many things to be associated with them that are covered by this dictionary. The reviewer would like to see the definition of casting still further simplified, by the elimination of the words hydrostatic pressure. V. C. F.

Forty Years Ago

A very sensible editorial in the July, 1909, issue of the JOURNAL deals with the then current practice (especially in America) of sabotaging moulding machines. Full details are given of the Annual Convention of the American Foundrymen's Association. It attracted no fewer than 1,800 registrations. There is an illustrated account of a 300-ton testing machine installed in the University of Birmingham. It was built by W. & T. Avery, Limited. Sir Hugh Bell, Bt., addressing the 7th International Congress of Applied Chemistry, included uranium as a steel-making addition. He also referred to "Albidur," an alloy of iron and aluminium—one-quarter the weight of iron and having a tensile strength of 15 tons per sq. in.—as being used in the manufacture of motor cars.

An American writer, Mr. H. F. Frohman, proposed specifications for various types of blackings.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

"AMERICAN HUSTLE"

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I was particularly interested in the second to the last sentence of your leading article in your issue of June 2 last, in view of the observations that I made in Germany in 1945 as a member of the Joint Intelligence Objectives Agency. For your information I quote a paragraph from Fiat Report 530, November 26, 1945.

Much excellent metallurgical work has been done by German scientists and many first-grade technical Papers have been published. There is a vast gap, however, between this technical knowledge and the application of it to commercial practice. This does not exist in the United States.

Yours, etc.,

B. F. SHEPHERD,
Chief Metallurgist.

Ingersoll-Rand Company,
Phillipsburg, N.J., U.S.A.

CASTING INSPECTION

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Please allow me to thank all those who have written expressing appreciation of my article on "Casting Inspection," which you published in April. The JOURNAL certainly "gets around," as I have received letters from the U.S.A. and many from Great Britain which were very complimentary and informative. One firm in Holland has adopted the methods disclosed, "lock, stock and barrel" (they cast 30 tons per day).—Yours, etc.,

J. HOWARD WILLIAMS.

Holman Bros., Limited,
Cambourne, Cornwall.
July 8, 1949.

House Organ

The Nickel Bulletin, Vol. 22, No. 5. The article "Nickel Alloy Steel Castings" in the May issue discusses the selection of steels to meet the new British Standards Specifications for steel castings. The issue of these specifications is significant of the tremendous advances in technique that have taken place over the last few years. The article deals at some length with methods of testing and includes a table which will assist in the choice of steels for a wide range of applications. The illustration shows a group of high-tensile steel castings for aircraft, indicating something of the design flexibility, accuracy of form, and excellence of finish possible by modern steelfoundry practice. This edition, which includes a number of interesting abstracts, can be obtained on application to The Mond Nickel Company, Limited, Sunderland House, Curzon Street, London, W.1.

Allied Ironfounders' Progress

Export Trade Difficulties

Mr. James Shaw, chairman and managing director of Allied Ironfounders, Limited, in his statement circulated with the accounts for the year ended March 31, 1949, says that the company's financial results, which exceed those of all previous years, have been achieved by the extent to which it has been possible to implement the policy of the directors as outlined in previous reports. A large part of the company's post-war reconstruction and development programme has been brought into effective operation in the course of the year, with consequent improvement in volume and quality of output. The demand for most lines of the company's manufactures, both from home and export markets, was maintained throughout the period and kept it fully employed to the capacity of available labour and materials. Relations with labour have been good, but the recruitment of skilled men is still a problem for the whole foundry industry. Heavy expenditure on improvements in working conditions and amenities is showing good results, and managements are concentrating on schemes to obviate the high rate of labour turnover in the moulding shops. The replanning of the sales organisation has been effectively carried through.

Output of rainwater and soil goods increased over the previous year by about 40 per cent., while the total output of baths for the period exceeded the figure of 200,000 forecast in the chairman's last report. Satisfactory progress has been made in the field of cooking and heating appliances. Improvements and developments in efficiency and design of appliances keep abreast of the national movement for economy in the use of all available fuels. The additional capacity reported last year resulted in an increase of 80 per cent. in the rate of output of the "Aga" heat-storage appliances.

Mr. Shaw says that in the course of the year the company made a special drive to expand its markets abroad and many countries were visited by principals of the company. Agencies and representation were reorganised and by diverting an extra proportion of manufactures from the home market, 12,000 tons were exported, against 4,000 tons for the previous year. While this trade will be pursued by all possible means, the prospects are not encouraging, he says, pointing out that there were many adverse conditions to cope with—"currency problems, industrial development in the Commonwealth, revived competition from European countries, and restriction of imports by the Union of South Africa."

Institute of Welding's New President

Mr. O. V. S. Bulleid has been elected president of the Institute of Welding for 1949-50. He is about to retire from his present post as chief mechanical engineer of the Southern Region of British Railways in order to become consulting mechanical engineer to Coras Iompair Eireann.

Mr. C. S. Milne, who has been elected vice-president of the Institute, is founder and head of the firm of C. S. Milne & Company, Limited, Deptford, London, S.E.8.

Obituary

MR. W. S. INGRAM, who died on June 26, was for many years a director of Walter W. Coltman & Company, Limited, boilermakers, of Loughborough.

MR. WILLIAM BROWN, London sales director of the Whitehead Iron & Steel Company, Limited, Newport, Mon, died suddenly on June 30. He was also a director of the company.

MR. GEORGE WALKER, principal of George Walker & Sons (Newark), Limited, ironfounders, which he founded, has died at the age of 82. He was Mayor of Newark in 1929 and became an alderman in 1935.

MR. ALBERT WEDDELL, chairman of W. G. Allen & Sons (Tipton), Limited, colliery engineers, etc., died suddenly on June 28. He was 67. Last March he retired from the office of managing director, but he retained the chairmanship until his death. Mr. Weddell joined the firm in 1915 and played a big part in its development.

ENG. REAR-ADMIRAL HAROLD HEPWORTH PERRING, who has died at the age of 63, had been a director of J. Samuel White & Company, Limited, shipbuilders, etc., of Cowes, since September, 1938, except for a period from 1940 to 1945, when he returned to the Admiralty for special duties. He was engineer manager of Chatham Dockyard from 1932 to 1938, when he retired at his own request, and machine-tool adviser to the Admiralty in 1939.

MR. RICHARD H. GREEN, a member of one of the founder families of R. & H. Green which originated in the 18th century and built sailing ships at Blackwall on the Thames, died on July 2. He was 83. When, in 1910, the company amalgamated with Silley Weir & Company, Limited, Mr. Green became the first chairman of the new company, R. & H. Green & Silley Weir, Limited. He continued as a director until recently. He had been chairman of the River Thames Dry Dock Proprietors' Association, and was a past-president of the Institute of Marine Engineers. Mr. Green was for many years a member of the Central Board of the Shipbuilding Employers' Federation, of which Board he was elected vice-president, and he served on the executive committee of the Federation.

Changes of Name

The following companies have recently changed their names, the new titles being given in parentheses:—

G. & W. DIES & TOOLS, LIMITED, Slough (Blandy, Isbill & Company, Limited).

VAN LEER AUTO DIE-CASTINGS, LIMITED, Bridgend, Glam (Hert Wares, Limited).

YENTON PLANT, LIMITED, Erdington, Birmingham, 23 (Yenton Plant & Construction Company, Limited).

SHARP & COOK (REFRIGERATION), LIMITED, engineers, etc., of Birmingham (Kroy Refrigeration, Limited).

SOUTHERN JOINERY, LIMITED, ironfounders, etc., of Kings Norton, Birmingham (Hamblin (Kings Norton), Limited).

H. KILNER, LIMITED (formerly Peds, Limited), mechanical engineers, etc., of London, E.C.1 (Unique Marketing Specialists, Limited).

TURNEY AGRICULTURAL CONTRACTORS, LIMITED, engineers, etc., of Weston-on-the-Green, near Bicester, Oxon (John Turney & Company, Limited).

Management Training Scheme

Part-time Students

The Ministry of Education has announced details of a scheme which will reorganise and encourage the development of training arrangements for part-time students of management in industry and commerce. The Urwick Report on Education for Management, published in 1947, estimated that industry and commerce employed nearly 500,000 men and women in managerial positions, and that recruitment was at the rate of 12,000 a year. The Ministry of Education approached the British Institute of Management with the object of preparing a single scheme of certification in management studies which would have the approval of the professional bodies. Agreement has now been reached, and local education authorities, governing bodies, and the principals of further education establishments have been asked to submit their plans for certificate and diploma courses for approval by the Ministry and the British Institute of Management.

For the intermediate certificate students will take a three-year part-time course concurrently with commercial or industrial employment. They must have reached 23 years before completing the course. For the diploma students must have obtained an intermediate certificate or be otherwise qualified to pursue more advanced study.

Copies of Rules 116, setting out the arrangements and conditions for these awards, together with notes for guidance, may be obtained from H.M. Stationery Office (price 2d.).

South Durham Steel and Iron's Development Scheme

Mr. Chetwynd Talbot, deputy chairman and managing director of the South Durham Steel & Iron Company, Limited, has announced that the Ministry of Supply has given final approval to a development scheme at the company's West Hartlepool works at a cost of £1,500,000. "Irrespective of the ultimate destiny of the iron and steel industry," he said, "it is the intention of the company to proceed with the scheme, in order that the full advantage may be obtained at the earliest date. We are determined not only to maintain, but to increase our efficiency. It would give greater confidence in the level of our future outputs if the Government would withdraw its present restrictions on the consumption of steel by the shipbuilding industry and other users. To-day the industry by its own efforts has overcome all the shortages which existed 12 months ago, and the continuation of the restricted use of steel in a highly competitive industry like shipbuilding will have dire effects upon its ability to compete with foreign rivals."

HARLAND ENGINEERING COMPANY, LIMITED, Alloa, is, in the near future, to make an issue of new shares to existing shareholders to fund its indebtedness of £151,715 by bank overdraft and bills.

C. & L. Hill's Golden Jubilee

New Office Block to be Erected

C. & L. Hill, Limited, manufacturers of non-ferrous sand and aluminium gravity die castings, of Willenhall, Staffs, celebrates its golden jubilee this year. One commemoration is the erection of a new office block, the foundation stone of which was laid last week, by Mr. Maurice Slater, chairman of the company.

The firm was founded by Charles and Lemuel Hill, on December 13, 1899, at Doctor's Piece, Willenhall, small castings ranging from a stair rod eye to a 6-in. door knob being produced for the brassfoundry trade. About 30 moulders were employed, and several of the original workpeople are still with the firm. Development was such that in 1913 the works were moved to Stringes Lane; a white-iron foundry had been added and considerable quantities of material were produced for the first world war. In 1920 the founders of the firm died within a few weeks of each other and a limited company was formed. In 1939, a branch works was opened at Wednesfield Road, Willenhall.

At the outbreak of war in 1939 both foundries were changed over to war production and a notable achievement was the manufacture of bronze compass coil corrector cases for the fight against magnetic mines. Recent developments of the company include the manufacture of zinc-alloy tools for the forming of plastics.

Five years ago the company became associated with Rubery, Owen & Company, Limited, structural engineers, etc., of Darlaston, Staffs.

Committee to Aid Standardisation

Mr. Harold Wilson, President of the Board of Trade, announced in the House of Commons that he has appointed a Committee to consider the organisation and constitution of the British Standards Institution, including its finance, in the light of the increasing importance of standardisation and the extended size and volume of work likely to fall on the B.S.I. in future and to make recommendations.

Members of the Committee are as follow:—Mr. Geoffrey Cunliffe, deputy chairman of the British Aluminium Company, Limited (chairman); Sir William Palmer, British Rayon Federation; Mr. A. V. Nicholle, chairman and managing director of the Automotive Engineering Company, Limited; Mr. Roger Duncalfe, chairman of British Glues & Chemicals, Limited; Mr. E. P. Harries, Trades Union Congress; Mr. O. W. Humphreys, General Electric Company, Limited; Sir Ernest Lemon, chairman of the Ministry of Supply Committee on Engineering Standardisation.

GLASGOW CORPORATION has accepted the offer of Cochranes (Middlesbro') Foundry, Limited, amounting to £17,707, for the supply of pipes and castings required for the extension of the East 36-in. water main from Blairbeth Road to Croftfoot Road.

Personal

VISCOUNT RIDLEY has been appointed a director of & W. Hawthorn, Leslie & Company, Limited.

DR. R. GENDERS, consultant metallurgist, informs us hat the address of his London office is now 20, uckingham Gate, S.W.1 (telephone: Victoria 6581).

MR. ERIC BROTHERTON has been appointed joint anaging director of the Hercules Cycle & Motor ompany, Limited, a subsidiary of Tube Investments, imited.

MR. G. M. SMIBERT, who will have a seat on the oard, has been appointed assistant to the managing irector of John G. Kincaid & Company, Limited, arine engineers, etc., of Greenock.

MR. R. J. HAWKINS, who has for some time managed he stockholding department of J. M. Tew & Rhoden, imited, iron and steel scrap merchants, of Sheffield, as been appointed a director of the company.

MR. W. J. MERIFIELD has resigned from the board of eerless & Ericsson, Limited, manufacturers of electric ood-preparing machinery, of Birmingham, owing to ill-health, and MR. HUGH WYLIE has been appointed hairman.

LORD MCGOWAN, chairman, and SIR WALLACE AKERS, director of Imperial Chemical Industries, Limited, ave had the honorary degrees of Doctor of Civil Law nd Doctor of Science, respectively, conferred upon hem by Durham University.

MR. P. W. MCGUIRE, who recently resigned his posiion as joint managing director of the Chesterfield Tube Company, Limited, has been appointed managing director of the Lilleshall Company, Limited, and its subsidiary, the Lilleshall Iron & Steel Company, Limited, Oakengates, Shrops.

MR. J. J. PARKES, managing director, has been appointed chairman of Alvis, Limited, motor-car and aero-engine manufacturers, of Coventry, upon the resignation of MR. A. E. NICHOLSON, who retains his seat on the board. MR. R. W. RUTLEDGE has been appointed deputy chairman and financial director of the company.

LORD BROCKET has been appointed chairman of the new board of Bamag, Limited, manufacturers of chemical and oilworks' equipment, of Buckingham Palace Road, London, S.W.1, which has recently been strengthened with the purpose of widening the activities of the company. Other new members are MR. ALFRED W. NEWBERY, DR. M. STEINSCHLAEGER and MR. EOIN C. MEKIE. MR. B. BREGMAN and MR. T. E. J. HILLMAN continue as directors of the company.

MR. B. T. W. BURGESS has been elected chairman, MR. S. COLLIER has been appointed managing director, and MR. E. S. STOCK and MR. A. R. SPELLER have been elected directors of Stemco, Limited, manufacturers of petrol-storage equipment, of Camden Town, London, N.W.1. MR. D. C. JAMES, MR. R. W. MOGFORD and MR. D. A. SHEPARD have resigned from the board. Mr. James and Mr. Mogford have resigned owing to pressure of other work and Mr. Shepard has been appointed executive assistant to the president of the Standard Oil Company (New Jersey) in New York.

MR. K. S. ARNOLD has been appointed assistant general manager of Duncan Stewart & Company, Limited, Glasgow, a subsidiary of the Davy & United Engineering Company, Limited, Sheffield. He has also joined the board of the company. Mr. Arnold was for 13 years chief engineer and superintendent at a large sugar factory in British Guiana. He subsequently held the post of Professor of Engineering at the Imperial Institute of Sugar Technology, Cawnpore, India, and then became Deputy Chief Mechanical Engineer to the Government of the United Provinces, India. He also conducted a special Government inquiry into the sugar industry of the United Provinces. On returning to Britain, Mr. Arnold was for some time a director and general manager of Fawcett, Preston & Company, Limited, Bromborough, and immediately prior to joining Duncan Stewart & Company was a director and manager of Blairs, Limited, Glasgow.

National Research Corporation

Sir Percy H. Mills to be Chairman

Sir Percy H. Mills has accepted the invitation of the President of the Board of Trade to become chairman of the National Research Development Corporation, which has been set up with effect from June 28. Sir Percy is managing director of W. & T. Avery, Limited, manufacturers of weighing machines, etc., of Smethwick. He is also a vice-president of the Association of British Chambers of Commerce. His new appointment is on a part-time basis for two years; he is serving without remuneration.

Other directors of the Corporation are:—LORD HALSBURY as managing director, his appointment being for three years, at £3,500 per annum; PROF. P. M. S. BLACKETT, Professor of Physics, Manchester University, as a part-time member for two years, at £500 per annum; SIR J. M. DUNCANSON, who was technical director of the British Iron and Steel Federation from 1945-48, as a part-time member for two years, without remuneration; SIR EDWARD H. HODGSON, principal finance officer, Board of Trade, as a part-time member for two years, without remuneration until his retirement from the Board of Trade; MR. W. E. P. JOHNSON, managing director of Power Jets (Research & Development), Limited, as a part-time member for one year, at £500 per annum; and SIR EDWARD DE STEIN, partner in the banking firm of Edward de Stein & Company, and a director of other companies, as a part-time member for two years, without remuneration.

The functions of the Corporation are to secure, where public interest requires, the development and exploitation of inventions resulting from public research, and acquiring, holding, disposing of and granting rights in connection with such inventions.

A BONUS SCHEME for employees and a reorganised production system have enabled the Northern Aluminium Company, Limited, Rogerstone, to increase its production up 40 per cent. above the figure for 1946, when the company first operated its Monmouthshire factory independently.

In Parliament

Steel and Copper Tubing Supplies

MR. PLATTS-MILLS asked the Minister of Supply if he was aware that the shortage of steel tubing required by building contractors was becoming more pronounced, and that copper tubing, at roughly double the cost, was being imported to meet the need, and what steps he was taking to overcome this shortage.

MR. G. R. STRAUSS: "No. New capacity is now in full production and supplies of this type of steel tubing have increased substantially since the beginning of the year. Copper tubing is not being imported to supplement supplies for building purposes."

Hard Coke for the Iron and Steel Industry

The MINISTER OF FUEL AND POWER told MR. A. EDWARD DAVIES that sufficient supplies of hard coke were now available to meet the needs of the iron and steel industry. In addition, some hard coke was now being exported. Forward estimates of hard-coke requirements of the iron and steel industry had been prepared, and energetic steps were being taken to see that coke-oven capacity—including new ovens—would be sufficient to produce the necessary supplies of coke.

Next Winter's Electricity Load

Arrangements for spreading the industrial electricity load next winter have been announced by the Minister of Labour. The Electricity Sub-committee of the National Joint Advisory Council has recommended some easement in the contribution asked of industry, and the Government has accepted the Committee's recommendations. During December, January and February, compared with the maximum load during the corresponding period of 1946-47, industry will be asked to cut its maximum peak demand on Mondays to Fridays inclusive by 20 per cent. during the hours of 8 a.m. to 10 a.m., but during the hours of 10 a.m. to noon the reduction asked for will be only 10 per cent. Last winter the 20 per cent. cut lasted from 8 a.m. to noon.

From December 1 until January 15 a reduction of 20 per cent. will also be necessary between 4 p.m. and 5.30 p.m. on Mondays to Fridays inclusive, but after that date the problem of the afternoon peak is to be left to the discretion of the Regional Boards for Industry. The Regional Boards will also make arrangements in the light of regional circumstances for the "fringe months" of October, November, and March.

FOULIS ENGINEERING SALES, LIMITED, Capital Building, Halifax, Nova Scotia, wishes to secure the representation for the Maritime Provinces and Newfoundland of United Kingdom manufacturers of engine lathes. Firms interested should communicate direct with the company, at the same time notifying the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1 (reference, C.R.E. 8665/49) of any action taken.

Swiss Ironfoundries' Position

Sales Shrinkage Reported

The Association of Swiss Iron Foundries, which embraces 71 firms with a total staff of almost 10,000, recently held its annual meeting, when it was reported that the raw material supply position had largely become normalised. Acting upon official recommendation, many establishments have accumulated reserves of pig-iron, scrap metal, coke and other essential materials. These purchases have brought about a considerable financial strain. Market conditions have deteriorated, but there is no need for taking any critical attitude.

The shrinkage of sales at constant wages and, in certain cases, increasing general costs, is a serious problem for Switzerland's foundries. The decline in employment is, however, partly attributable to the changed conditions in the Swiss machinery industry. Exports of machinery and apparatus have declined through foreign exchange difficulties. In addition, building activity in Switzerland has declined, but appears to be again on the upgrade.

Thos. Firth & John Brown

The annual report of Thos. Firth & John Brown, Limited, Sheffield, states that the company's name appears in the Third Schedule of the Iron and Steel Bill. Its securities would therefore fall to be compulsorily acquired by the proposed Iron and Steel Corporation of Great Britain.

The report also declares that the value of the company's securities for compensation purposes will be the average of the mean of the quotations appearing in the Stock Exchange Official Daily Lists on certain specified dates in the year 1945. These values are as follow:—3½ per cent. debenture stock £97½ per cent.; 6 per cent. preference shares, £1 8s. 9d. per share; 5 per cent. (income-tax free) preference shares, £1 16s. 3d. per share; "A" ordinary shares, £3 18s. 2d. per share.

Of the 1,100,000 "A" ordinary shares of the company, only 274,823 are held by the members of the public and, in view of this limited market, the directors may be advised to contest the above assessment of their value.

B.I.C.E.R.A. Appointments

Viscount Falmouth, chairman of the National Gas & Oil Engine Company, Limited, Ashton-under-Lyne, Lancs, has been re-elected president of the British Internal Combustion Engine Research Association for 1949-50. Vice-Admiral (E.) Sir Denys C. Ford, Lt.-Gen. Sir Frederick G. Wrisberg, Dr. S. F. Dorey, Air-Comm. F. R. Banks, and Sir Lynden Macassey have been re-elected as vice-presidents. Major-Gen. E. H. Clayton has also been elected a vice-president, and Mr. J. Jones has been elected chairman of council in succession to the late Mr. E. P. Paxman.

News in Brief

THE ENGINEERS' GUILD has formed a Western branch, with headquarters at Cardiff.

C. H. BROUGHTON (1934), LIMITED, is erecting a new machine shop and foundry at Arthur Street, Brighouse, Yorks.

THE COMBINED TIN COMMITTEE has made interim allocations of tin metal for the second half of 1949 amounting to 25,070 tons.

THE GLASGOW marine radio and signalling branch of Siemens Bros. & Company, Limited, has moved to 9, India Street, Glasgow, C.2.

BOOTH & BROOKES, LIMITED, ironfounders, of Burnham-on-Crouch, Essex, to-day (Thursday) celebrates the fiftieth year of its foundation.

MAINLY WITH THE OBJECT of attracting apprentices, Croydon Foundry, Limited, has a stand at the Croydon Exhibition, which closes on Saturday.

V. L. FARTHING & COMPANY, consulting engineers and lubrication technologists, has moved into larger premises at 329, Tower Building, Liverpool, 3.

THE MINISTRY OF FOOD has reduced the price of linseed oil from £150 to £138 per ton, naked, ex-works, and the price of castor oil from £122 to £110 per ton.

BLAW-KNOX, LIMITED, is to supply concrete-mixing and handling equipment for the building of the concert hall on the South Bank of the Thames for the Festival of Britain 1951.

THE DIRECTORS of G. N. Haden & Sons, Limited, heating and electrical engineers, of Trowbridge, Wilts, have decided, as a result of present market conditions, to postpone the proposed issue for cash of 250,000 of the newly created 5 per cent. cumulative preference shares.

HACKBRIDGE & HEWITTIC ELECTRIC COMPANY, LIMITED, proposes to create 1,200,000 ordinary 5s. shares, 200,000 of which it is proposed to issue in the near future at 5s. a share to ordinary stockholders in the proportion of one in nine to their present holdings.

HOLIDAYS at the Mitcham, Brixton and Balham works of Philips Electrical, Limited, will be from July 23 to August 2, at the Blackburn works from July 16-24, and at the Hamilton works from July 30 to August 9. Holidays are being staggered at the works at Tooting and Waddon.

SPEAKING AT A MEETING of Dundee Chamber of Commerce, Mr. Edward McGregor, president, stated that while most engineering firms in the city had a fair volume of work in hand which would carry them on for some time, the position was not nearly so healthy as it had been in recent years.

THE INCREASE in capital of Babcock & Wilcox, Limited, boilermakers, etc., of Renfrew, to £8,800,000 by the issue of 2,000,000 4 per cent. £1 cumulative preference shares, and 716,609 £1 ordinary shares at 57s. 6d., was unanimously approved at an extraordinary meeting of the company on July 5.

THERE ARE NOW enough modern solid-fuel appliances to supply not only all new houses, but to make a start on the older houses as well. A selection of the latest appliances may be seen at the "New Hearths for Old" Exhibition, opened by the Women's Advisory Council on Solid Fuel, at 18, South Molton Street, London, W.1.

AT AN EXTRA-ORDINARY MEETING on July 4 of Thompson Bros. (Bilston), Limited, manufacturers of galvanising plant, etc., proposals to increase the capital of the company and issue bonus shares were carried unanimously. Stockholders are to receive one new ordinary share of 5s. for each 5s. worth of ordinary stock held.

JOHN O'CONNOR, iron dresser, of Witt Street, Widnes, was awarded £1,500 agreed damages and costs at Liverpool Assizes in a case against his employers, Widnes Foundry & Engineering Company, Limited. O'Connor, who had been engaged in chipping iron castings, was struck in the left eye by a piece of metal; as a result he lost the use of that eye.

VARIOUS CHEMICALS, scientific instruments, optical elements and compounds or rare earth metals are among the items to be exempted from key industry duty from July 1 to December 31, 1949. These exemptions are given effect by a Treasury Order entitled "The Safeguarding of Industries (Exemption) (No. 5) Order, 1949" (S.I. 1949, No. 1158, price 1d.).

THE DIRECTORS of R. W. Crabtree & Sons, Limited, printing-machinery manufacturers, of Leeds, propose to capitalise the £450,000 general reserve by issuing to ordinary holders three additional ordinary shares of 5s. each in respect of each 5s. ordinary share now held. It is proposed then to consolidate the shares into £1 shares prior to their being converted into stock.

NEGOTIATIONS FOR THE acquisition by the Bentley Engineering Company, Limited, Leicester, of the ordinary share capital of Wildt & Company, Limited, manufacturers of hosiery machinery, also of Leicester, have been discontinued. The directors of Wildt & Company announce that they are not prepared to recommend acceptance of the offer made by Bentley Engineering.

THE RESETTLEMENT ADVICE SERVICE, which was set up by the Minister of Labour and National Service in May, 1945, to give assistance by means of information and advice to men and women released from the Forces and other forms of war service, closed down on June 30. The demobilisation of the wartime Forces is now complete, and the number of inquiries about resettlement problems has diminished.

MARSHALL, SONS & COMPANY, LIMITED, manufacturers of steam engines, boilers, etc., has announced a 50 per cent. cut in its production programme because of the world shortage of sterling. The firm has dismissed 183 men from its works at Gainsborough, 174 at Leeds, and 60 at Sprotbrough. All the men at Gainsborough and 49 of the men at Leeds are over 65. The total number of men employed at the three factories is 3,900.

REID & GRAY, LIMITED, P.O. Box 202, Dunedin, New Zealand, desires to represent United Kingdom manufacturers of high-speed Diesel engines and variable-pitch propellers for boats in the Dominion. Firms interested should communicate direct with the company, at the same time notifying the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1 (reference, C.R.E. (I.B.) 16717/49), of any action taken.

AT THE CONFERENCE of the British Medical Association at Harrogate, industrial medical services and the preventive aspect were discussed. It was stated that medical research into occupations was a necessity if the best use was to be made of this country's manpower. Attention was also drawn to the poor provision made for health supervision, particularly in the smaller factories, and to the resultant cost to the nation of this lack of care.

THE CHANGE from a sellers' to a buyers' market is reflected in the inquiries made at the Engineering Centre, in Glasgow. It is stated that, while work is still plentiful, inquiries by buyers are now examined more closely than 12 months ago. During the first quarter of this year trade inquiries were described as excellent and covered a wider field than before, but after the Budget they fell away sharply. The position is now back to the March standard, which was satisfactory.

FOLLSAIN-WYCLIFFE FOUNDRIES, LIMITED, announces the following appointments of sales representatives:—Mr. H. Sobey, Sandall, Fentham Road, Hampton-in-Arden (Warwickshire, Worcs, and South Staffs); Mr. W. Clifford Hand, Crown Inn, Rumwel, near Taunton (Somerset, Dorset, and Wilts); Mr. A. Williams-Gardner, 3, Winton Square, Stoke-on-Trent (Shrops, North Wales and North Staffs); Mr. P. R. Harris, Brook House, Stowmarket (Suffolk, Norfolk, Cambs, Hunts, Northants, and North Beds); Mr. H. A. Winterbottom (Yorks).

IN HIS STATEMENT accompanying the annual report, Mr. Walford H. Turner, chairman of W. & T. Avery, weighing machine manufacturers, etc., of Birmingham, states that the way is now clear, subject to the consent of the C.I.C., for "companies such as ours to bring the issued capital more nearly into relationship with the capital employed in the business. . . ." The board thinks dividend limitation and general commercial trends must be kept in view in considering when is the appropriate time for application to be made for approval to such an issue, and the directors propose to keep the position under review.

EXPORT SALES OF British Insulated Callender's Cables, Limited, increased by 86 per cent. in 1948. Sir Alexander Roger, chairman of the company, states that at least two substantial export orders have already been lost to foreign manufacturers owing to the maintenance of metal prices in this country above the world level. "With all the initiative and efficiency in the world," he says, "we as a company cannot compete on price with many overseas concerns if we have to pay, because of Government buying, prices for such vital raw materials as copper and lead far in excess of the world prices for these metals."

EXPORTS FROM THE TEES in the first five months of this year have not been exceeded since 1939, the total tonnage being 528,814, while an import trade of 1,308,545 tons was the second highest since the end of the war. Presenting these figures at the monthly meeting of the Tees Conservancy Commission, the chairman (Mr. George West Byng) said that the principal increases in imports as between April and May were:—Iron ore, 5,560 tons; scrap, 16,560 tons; billets and pig-iron, 4,500 tons. The principal increases in exports were:—Angles, bars and plates, 11,700 tons; cargo coal, 10,113 tons; bunker coal, 4,600 tons.

SOUTHERN AIRCRAFT (EAST AFRICA), LIMITED, Fort Ternan, Kenya, desires to represent United Kingdom manufacturers of engineering products or to provide assistance to firms already represented who have no "service after sales" arrangements. Firms interested should write direct to the company or to the managing director, Mr. J. E. Coxon, who is at present in this country (c/o Southern Aircraft (Gatwick), Limited, Gatwick Airport, Surrey), at the same time notifying the Commercial Relations and Exports Department, Board of Trade, Thames House North, Milbank, London, S.W.1 (reference, E.P.D. 46498/48), of any action taken.

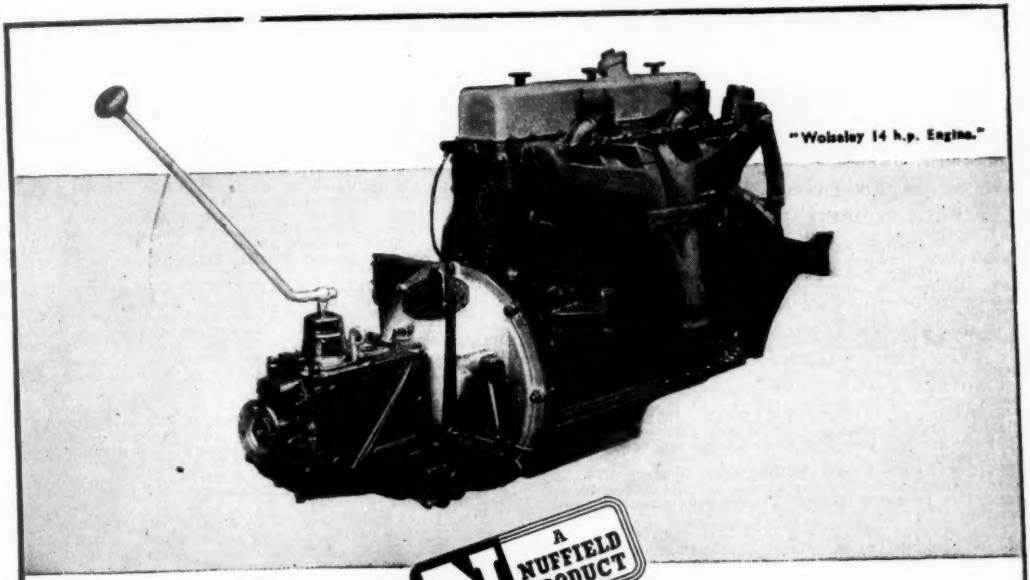
FOLLOWING THE MERGER of interests resulting from the formation of the Consolidated Zinc Corporation, Limited, it is announced that Sir Clive Baillieu, who is a director of the Consolidated Zinc Corporation, has resigned from the boards of Zinc Corporation, Limited, Imperial Smelting Corporation, Limited, and New Broken Hill Consolidated. Mr. D. P. C. Neave, who is a director of the Consolidated Zinc Corporation, has been elected to the boards of the Zinc Corporation and New Broken Hill Consolidated. Sir Basil Goulding, who was formerly a director of Imperial Smelting Corporation, has been elected a director of the Consolidated Zinc Corporation and Mr. L. B. Robinson and Mr. D. P. C. Neave have been elected as vice-chairmen.

Whitworth Engineering Scholarships

The Ministry of Education has announced details of the Whitworth scholarships in engineering to be offered for competition in 1950. Two senior scholarships and five scholarships will be available for candidates of British nationality who are not more than 26 years of age. They are required to have had practical experience in engineering before taking up an award.

Whitworth senior scholarships are for candidates who have an engineering degree or a higher national certificate with two distinctions, or are in the last year of a course leading to one of these qualifications. The annual value of the awards is £325, and they will be tenable for two years for a course of further training in industry or for research work. Candidates are required to submit a thesis on one of a number of specified subjects.

Whitworth scholarships are for students whose further education has been limited to evening classes. Their annual value is £200, though this amount may be increased depending on the cost of the course and the means of the holder. They are tenable for three years either in industry or at an educational establishment. They will be awarded on the results of the Whitworth scholarships' examination to be held in April, 1950.



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THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Company News

(Figures for previous year in brackets.)

BLAW-KNOX—Interim dividend of 10% (same).
ELKINGTON & COMPANY—Dividend of 8% (same).
HOBBS, HART & COMPANY—Dividend of 6% (same).
BEANS INDUSTRIES—Interim dividend of 10% (same).
MATTHEW HALL & COMPANY—Dividend of 25% (same).
MIRRLEES WATSON COMPANY—Dividend of 8% (same).
BARROW, HEPBURN & GALE—Interim dividend of 10% (same).
MASSEY-HARRIS—Interim dividend of 10%, tax free (same).
PERMUTIT COMPANY—Dividend of 10% and bonus of 2½% (same).
HICK, HARGREAVES & COMPANY—Final dividend of 8%, making 10% (same).
A. E. JENKS & CATTELL—Second interim dividend of 2½%, tax free (same).
HAMMOND LANE FOUNDRY COMPANY—Interim dividend of 3% (same).
SWAN, HUNTER & WIGHAM RICHARDSON—Interim dividend of 4% (same).
CALEDON SHIPBUILDING & ENGINEERING COMPANY—Dividend of 10% (same).
LINOTYPE & MACHINERY—Preference dividend of 12%, being arrears for the period April 12, 1928, to April 11, 1930.
RENOLD & COVENTRY CHAIN COMPANY—Final dividend of 12%, making 15% for the year ended April 3. (For the previous period of 40 weeks the final dividend was 9%, making 12%.)
J. H. SANKEY & SON (HOLDINGS)—Dividend of 4d. per share, equivalent to 20% per annum, for the period November 1, 1948, to March 31, 1949. The company was incorporated on August 13, 1948.

ARMSTRONG, STEVENS & SON—Net profit to March 31, £29,969 (£25,100); to additional depreciation, nil (£5,000); general reserve, £15,000 (£10,000); dividend of 20% (same); forward, £14,685 (£10,727).

METAL CLOSURES—Profit for 1948 before tax, £82,052 (£67,846); provision no longer required, £3,000; to tax, £41,500 (£33,500); final dividend of 20%, making 40% (same); to reserve, £18,000 (£10,000); forward, £24,342 (£20,790).

SCOTTISH CABLES—Trading profit for the year ended April 30, £254,060 (£208,235); balance of profit, after all charges, including tax, £104,822 (£66,388); brought in, £35,011; to general reserve, £76,058 (nil); final dividend of 20%, making 30% (same); forward, £17,575.

HACKBRIDGE & HEWITTIC ELECTRIC COMPANY—Net profit of group for the year to March 31, after depreciation, tax, etc., £74,310 (£52,995); retained by subsidiary, nil (£1,293); to directors' pensions, £5,000 (nil); general reserve, £30 000 (£15,000); final dividend of 8½% (8%), making 12½% (12%); forward, £27,728 (£27,055).

WM. BUTLER & COMPANY (BRISTOL)—Consolidated trading profit, etc., for 1948, £109,829; to depreciation, £36,650; audit, £650; income tax, 1949-50, £26,000; profits tax, £13,000; to "adjustments," £1,220; net balance, £34,749; to preference dividend, £6,576; final ordinary dividend of 7½%, making 12½% (same) to general reserve, £8,262; forward, £22,971.

S. E. OPPERMAN—Consolidated trading profit for 1948, £23,976 (£35,061); to depreciation, £9,588 (£3,452); directors' emoluments, £4,570 (£4,546); auditors' remuneration, £500 (£510); additional rent on Crown land, £6,719 (nil); balance, £2,599 (£26,553); brought in, £29,028 (£30,152); to tax, £1,308 (£13,927); deferred repairs, nil (£6,900); parent company dividend, nil (£6,600); forward, £30,319.

LIGHT PRODUCTION COMPANY—Income to March 31, £46,343 (£19,141 for 11 months); to depreciation, £6,356 (£4,118); directors' emoluments, £5,450 (same), etc.; taxation, £18,000 (£5,050); net profit, £15,279 (£4,365); over-provided taxation, £14,487 (nil); brought in, £22,858 (£21,480); to special provision for depreciation, £10,000 (nil); final dividend of 20%, making 30% (10%); forward, £34,787.

SHEFFIELD STEEL PRODUCTS—Consolidated trading profit to March 31, £282,089; investment income, etc., £6,503; to directors' fees and emoluments, £23,539; audit fees, £645; leaving £264,408; brought in, £32,372; excess provisions no longer required, £47,050; to tax, £124,500; depreciation, £28,750; stock and other contingencies reserve, £50,000; general reserve, £75,000; dividend of 15% (same); forward, £50,228.

MONKS, HALL & COMPANY—Trading balance to April 2, £153,629 (£212,176); to audit fee, £316 (£315); deferred repairs, £28,681 (£9,412); depreciation, £12,500 (same); profits tax £13,846 (£15,071); income tax, £48,932 (£70,667); E.P.T. recoverable, £28,681 (£9,412); net profit, £78,035 (£113,603); to stocks provision, £5,527 (nil); general reserve, £10,000 (£28,367); interim dividend of 20% (same); forward, £89,306 (£57,580).

WEST'S GAS IMPROVEMENT COMPANY—Consolidated trading profit to March 31, £118,245; to directors' remuneration, £19,245; depreciation, £5,434; tax, £49,589; leaving £46,369—parent company £36,247; retained by subsidiary, £10,122; to provision against research and experimental expenditure, £20,000; dividend of 12½% (same); forward, £50,599 (£36,722)—parent company £37,091 (£33,336), subsidiary £13,508 (£3,386).

GRAYSON, ROLLO & CLOVER DOCKS—Trading profit to March 31, £393,643; investment income, £3,393; fees, £63; to directors' emoluments, £25,718; auditors' remuneration, £647; tax, £172,000; leaving £198,734; unclaimed dividends, £256; transferred from tax reserve, £50,000; brought in, £34,125; to replacements and development reserve, £100,000; written off investments, £10,000; general reserve, £100,000; dividend of 10%; forward, £64,444.

BROMILOW & EDWARDS—Trading profit for the year to March 31, £39,593 (£44,536); interest, £37 (£60); to directors' fees, £1,400 (same); depreciation, £4,891 (£5,197); taxation, £13,300 (£18,800); net profit, £16,818 (£15,676); brought in, £2,243 (£430); reserves not required, £8,305 (£2,152); written off shares in subsidiary, nil (£2,453); to general reserve, £16,500 (£6,000); dividend of 10% and bonus of 2½% (same); forward, £3,304 (£2,243).

CLIMAX ROCK DRILL & ENGINEERING WORKS—Trading profit, with sundry revenue, for 1948, £61,036 (£93,353); to depreciation, £19,524 (£24,216); directors' emoluments, £1,681 (£1,700); interest and bank charges, £5,110 (£4,551); leaving £34,721 (£62,886); brought in, £16,047 (£15,711); to tax, £19,000 (£34,500); general reserve, £5,000 (£15,000); final dividend of 5% (7½%), making 10% (12½%); additional directors' remuneration, £450 (£675); forward, £16,418.

DARLINGTON & SIMPSON ROLLING MILLS—Trading profit to March 31, £175,335 (£153,769); interest, rents, etc., £838 (£464); to directors' remuneration, £5,999 (£5,437); temporary loan interest, nil (£7,800); depreciation, £67,251 (£71,956); tax, £10,477 (£2,012); leaving £92,446 (£67,028); to 5½% preference dividend, £10,588 (£8,750); 6% preference dividend, £11,550 (£9,277); ordinary dividend of 9% (same); general reserve, £45,000 (£25,000); forward, £42,871 (£36,373).

FRANCIS MORTON & COMPANY—Trading profit, with sundry revenue, for the year ended March 31, £92,036 (£86,645); to directors' emoluments, £6,715 (£6,543); auditors' remuneration, £215 (£211); U.K. tax, £46,591 (£42,781); depreciation, £6,535 (£4,932); leaving £31,980 (£32,178); brought in, £52,151 (£50,317); overprovided tax, £3,697 (nil); refund of war risks premiums, £573 (nil); final dividend of 12½%, making 20% (dividend of 15% and bonus of 5%); general reserve, £15,000 (£11,644); forward, £54,701.

STANCROFT—Trading profit, plus sundry revenue, for the year ended March 31 £90,329 (£114,622, less £25,617 earned prior to incorporation); to depreciation and amortisation, £3,717 (£4,332); directors' emoluments, £8,183 (£7,611); auditors' remuneration, £131 (same); registrars' fees, £315 (£73); balance, £77,983 (£76,852); brought in, £6,998; to tax, £45,828 (£47,854); preference dividend, £2,750 (£1,375); final ordinary dividend of 35%, making 50% (37½%, equivalent to 50% per annum); forward, £8,903.

HENRY HOPE & SONS—Consolidated accounts to March 26 show trading profits, after providing £48,022 (£42,988) for depreciation, £710,769 (£641,550); other income, £18,074 (£36,280); to tax, £353,591 (£301,029); net profit, £376,252 (£376,801)—applicable to group £353,076 (£354,524), outside interests £22,176 (£22,277); net profit of group, £353,076 (£354,524); adjustments relating to previous years, £4,552 (£45,844); to profits retained by subsidiaries—proportion attributable to group, £110,493 (£110,802); supplementary pension scheme, £10,000 (£20,000); stock and unfinished contracts reserve, nil (£30,000); debtors' reserve, nil (£11,000); leaving £237,135 (£228,566).

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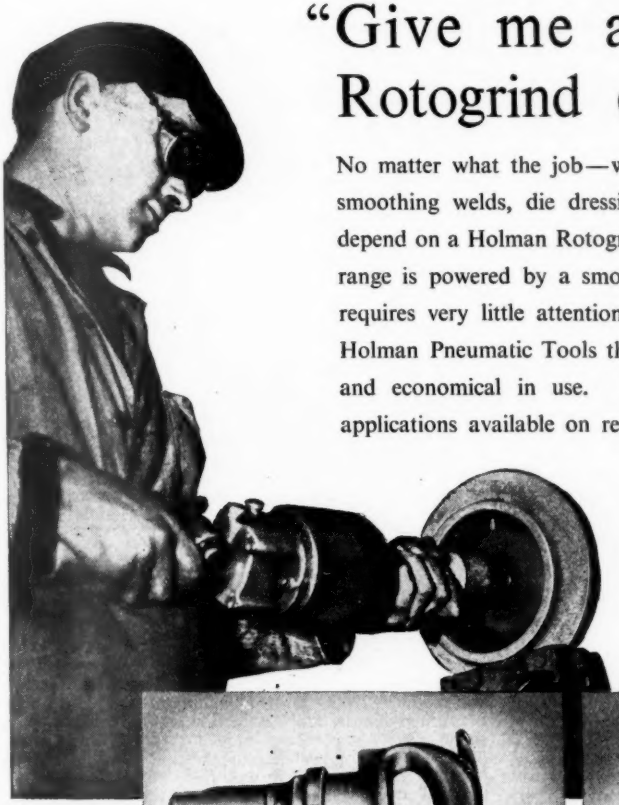

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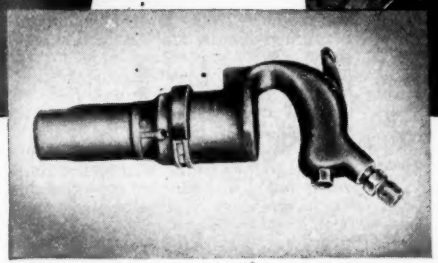

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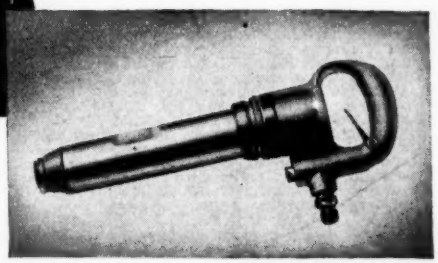

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H.25

SPURLING MOTOR BODIES—Consolidated accounts to February 28 show trading profit, £210,429 (£260,326); other income, £413 (£713); to depreciation of fixed assets, £14,441 (£13,559); debenture interest, £5,500 (same); life assurance premiums for debenture redemption, £3,304 (same); pension to dependants of deceased director, £264 (nil); audit, £1,689 (£1,633); registrar's remuneration, £474 (£526); leaving £185,170 (£236,517); to U.K. tax, £110,747 (£131,341); general reserve, £3,000 (same); contingencies reserve, nil (£20,000); employees' welfare fund, £2,000 (same); dividend of 37½% (same); forward, £87,482 (£69,622).

NEWMAN HENDER & COMPANY (made public on December 6, 1948)—Consolidated profit and loss account for the year to April 2 shows aggregate profit, £102,807; to depreciation, £14,689; mortgage interest, £343; auditors' remuneration, £672; tax, £49,002; leaving £38,101; proportion attributable to minority shareholders, £1; retained by subsidiaries, £2,207; net profit of parent company, £35,893; parent's net profit, £35,893 (£29,805); to preference dividend, £2,726 (£1,526); final ordinary dividend of 7½%, making 12½% (same), £10,986 (£8,814); leaving £22,181 (£19,465); brought in, £42,881 (£23,416); transferred to reserve against fall in stock values, £20,000 (nil); forward, £45,062.

SHEEPBRIDGE ENGINEERING (made public October 8, 1948)—Consolidated trading profit for the period ended March 31, £478,588; to profits prior to acquisition, £67,479; leaving £411,109, including £22,576 of non-recurring nature; investment income, £88,707; to depreciation, £78,001; subsidiaries' audit fees, £631; tax, £224,279; leaving £196,905; brought in from subsidiaries, £154,794; tax reserves no longer required, £39,514; transferred to capital reserve, pre-acquisition profits, £172,701; net profit brought down, £196,905; transferred to capital reserve, pre-acquisition profits, £59,177; to minority shareholders, £10,019; parent's dividends, £64,130; forward £85,186, group interest £59,748, minority interest £25,438.

GLACIER METAL COMPANY—Trading profit to February 28, £262,840 (£321,460); other income, £169 (£70); to depreciation, £21,233 (£19,788); directors' remuneration, £16,205 (£11,190); pension to past director, £335 (same); audit and accountancy, £2,010 (£1,728); profits tax, £26,020 (£31,000); adjustment of past charges, nil (£12,164); income tax, £89,287 (£104,317); net profit, £107,919 (£141,018); brought in, £21,856 (£19,199); adjustment of past depreciation charges, nil (£40,000); contingencies reserve no longer required, nil (£10,000); to stock contingencies reserve, £50,000 (nil); general reserve, £35,000 (£175,000); dividend of 7½% (same); forward, £31,414.

CHUBB & SON'S LOCK & SAFE COMPANY—Consolidated trading profit for the year ended March 31, £111,023 (£86,005); sundry income, £208 (£1,203); provision for taxation no longer required, £2,000 (£24,700); to directors' emoluments, £17,763 (£15,053); depreciation and amortisation, £20,173 (£10,058); interest on bank overdrafts, £840 (£1,083); deferred repairs, nil (£2,000); profits tax, £14,500 (£12,375); income tax, £27,200 (£25,925); net profit, £32,755 (£45,414); to increase in amount carried forward by subsidiaries, £1,082 (£4,733); bad debts reserve, nil (£2,000); stock reserve, £5,000 (same); general reserve, £12,500 (£12,348); preferred ordinary dividend, £2,750 (same); final ordinary dividend of 10%, making 15%, on increased capital; forward, holding company's account, £11,581 (£10,608).

THOS. FIRTH & JOHN BROWN—Consolidated profit and loss accounts for the 15 months to March 31, 1949, show balance from trading £1,490,365; gross income from investments, £138,010; profits from contracts of previous years, £214,410; other receipts, £19,874; to depreciation, £362,966; mortgage, debenture, and loan interest (gross), £59,137; fees, etc., £9,158; to profits tax, £205,550; income tax, £552,764; repayment of E.P.T. in respect of deferred repairs, £160,500; net tax charge, £597,814; taxation on receipts relating to preceding years, £210,000; profit, £633,594; to dividends (net) on Thos. Firth & John Brown preference £54,000, ordinary £193,750; dividends to outside holders, £15,500; undistributed profits of subsidiaries for outside holders, £5,509; forward, £1,137,268; final ordinary dividend of 10% net, making 12½%, tax free (10%, tax free).

W. & T. AVERY—Group trading profit to March 31, £1,425,879 (£1,084,144); revenue from properties, £3,380 (£3,883); investments income, £24,412 (£40,001); to depreciation and obsolescence, £197,068 (£141,633); capital reserve in respect

(*Continued at foot of next column.*)

Lloyd's Register Committees

Appointments

Among the appointments to the general and technical committees of Lloyd's Register, consequent upon the fusion of that society and the British Corporation Register, are:—SIR MAURICE DENNY, chairman of William Denny & Bros., Limited, shipbuilders, of Dumbarton; MR. GEORGE BARRIE, a director of Barclay, Curle & Company, Limited, shipbuilders, of Glasgow; MR. W. C. WARWICK, a director of the Falmouth Dock & Engineering Company, Limited, and many other companies; MR. WILLIAM LOGAN, a director of the Anderson-Grice Company, Limited, crane manufacturers, etc., of Angus.

MR. L. V. DUNLOP, a director of Harland & Wolff, Limited, and MR. ALEXANDER S. MACLELLAN, a director of Glenfield & Kennedy, Limited, hydraulic engineers, etc., of Kilmarnock, have been elected to the technical committee (by the Institute of Engineers and Shipbuilders in Scotland), together with SIR ANDREW MCCANCE, a director of Colvilles, Limited, and many other companies (Iron and Steel Institute); MR. ALLAN J. MARR, a director of Sir James Laing & Sons, Limited, shipbuilders, of Sunderland (Shipbuilding Conference); and MR. W. H. PURDIE, a director of William Doxford & Sons, Limited, shipbuilders, of Sunderland (National Association of Marine Enginebuilders).

Price of Copper Increased

Ministry Follows U.S. Lead

On Monday, the Minister of Supply stated that it was the Government's desire not to handicap exporters any longer by charging them more than the world price for copper. The United Kingdom quotation was accordingly cut by £13 10s. per ton to £104. The official price in the United States moved up by $\frac{5}{8}$ cents per lb. on Tuesday, however, and the Ministry of Supply then lost no time in following that rise and, as from yesterday (Wednesday), the U.K. price was increased by £3 10s. to £107 10s.

The Ministry of Supply's latest announcement came after page 70 of this issue of the JOURNAL had gone to press, and this should be appreciated when referring to the information relating to non-ferrous metals printed on that page. A complete list of the revised prices is incorporated in the "Price List" on page 30.

On Tuesday, a leading U.S. customs smelter put up the price for lead by $\frac{1}{4}$ cent to 13½ cents per lb. (equivalent to £75 1s. a ton), following an advance of 1 cent per lb. last Friday.

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increase in replacement cost of fixed assets, £72,300 (same); auditors' fees, £4,455 (£4,386); overseas tax, £60,568 (£61,603); income tax, £481,478 (£377,068); profits tax, £156,739 (£143,141); proportion attributable to outside holders in subsidiaries, £5,386 (£5,820); net profit, £475,677 (£322,077); parent company's net profit, £256,215 (£162,694); tax provision no longer required, £40,000 (£75,000); war damage provision no longer required, £39,189 (nil); brought in, £96,854 (£71,261); to reconversion and development reserve, £100,000 (same); reserve against stock, £140,000 (nil); pensions fund, £10,000 (same); final dividend of 15%, making 20% (same); forward, £80,157.

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Raw Material Markets

Iron and Steel

Outputs of pig-iron are fairly satisfactory, but, in the aggregate, they do not exceed the current rate of consumption. Steelmakers have reasonable reserves of basic iron, but there are only slender stocks of iron at the foundries and regular deliveries are necessary to sustain operations without interruption. In the light castings trade, only limited supplies of high-phosphorus iron are available, but the heavy engineering establishments are more favourably placed, since they are not tied down to one grade of pig-iron.

Current deliveries of foundry coke are sufficient to allow consumers to place tonnages into stock. It is hoped that users will be able to continue this practice freely during the summer months.

There has been a marked relaxation of pressure for re-rolled products for delivery in Period III and works are still open to accept orders for bars and light sections. Difficulties formerly experienced in securing adequate supplies of billets, blooms and slabs have been largely overcome, thanks to the heavier intake of foreign material. On the other hand, the demand for sheet bars is unabated and rollers of light sheets are offered far more business than they can possibly undertake.

There is no hint of any recession in the demand for steel plates; in fact, far bigger tonnages are required to satisfy the urgent needs of shipbuilders, boilermakers, and power-plant erectors. Heavy steel rails and other railway equipment are also eagerly sought. There has, however, been some shrinkage in the call for sectional material and mills are still open to accept additional orders for the summer period.

Non-ferrous Metals

The Minister of Supply announced on Monday that the London Metal Exchange is not to be reopened for the time being. He stated that he was at present unable to agree to dealings in copper, lead and zinc. No decision about future marketing of tin had yet been reached, he added. It was also announced on Monday that the Ministry of Supply had reduced its selling prices of copper, lead and zinc. Details of the Ministry's statement appear elsewhere on this page.

U.S. copper consumers have been buying more freely; there have been signs of some return of confidence and buying prices for scrap have been raised. In these conditions the customs smelters' price of electrolytic copper has been increased from 16 cents to 17⅛ cents per lb.

During May, U.K. copper consumption was 23,269 tons of primary and 18,980 tons of secondary (figures for April were 23,192 and 14,474 tons, respectively), consumption of zinc was 22,439 (20,500) tons and of lead 27,084 (22,852) tons. At May 31, Government and consumer stocks were 117,491 tons of copper, 60,741 tons of zinc, and 46,660 tons of lead, compared with tonnages at April 30 of 115,353, 50,580 and 33,940 respectively. U.K. consumption of tin during May was 1,614 tons (April, 1,533 tons) and Government and consumer stocks at May 31 were 14,843 tons of tin metal and 5,572 tons of tin in ore and concentrates, the figures at April 30 being 13,780 and 6,739 tons respectively. Consumption so far this year shows a falling-off compared with last year's average of 5 per cent. for copper and lead, 10 per cent. for zinc and 15 per cent. for tin.

Metal Prices Reduced

Loss to be Met by the Exchequer

United Kingdom prices of copper, lead, and zinc were reduced on Tuesday. The reductions in the selling prices, taking into account freight, delivery charges, and other factors, bring our prices for copper, lead, and zinc into line with those current in the United States. Announcing this, the Ministry of Supply stated that the Exchequer would have to bear a loss, the size of which depended on how future price movements affected values of stocks in hand.

Because of the present unstable nature of the market in non-ferrous metals, the Ministry has, for forward purchases, instituted a new arrangement. Under this users can continue to buy forward up to six months' requirements for copper and zinc, and three months in the case of lead. The buyer will, however, have to pay a premium as an insurance against a rise in prices.

The new prices (per ton, delivered) are:—Electrolytic copper, £104, a reduction of £13 10s.; good soft pig-lead, £75 10s., a reduction of £6 10s.; good ordinary brand zinc, £58, a drop of £20. Discounts and premiums remain unchanged.

The Ministry's buying price for rough copper in slabs of from 2 cwt. to 3 cwt. is reduced from £80 to £70 per ton. The prices of zinc oxide are also reduced (by £17 per ton) to the following figures for lots of not less than 2 tons, delivered buyers' premises:—Red Seal, £58 15s.; Green Seal, £60 5s.; White Seal, £61 5s.

Licences to acquire copper and zinc will now be granted only against:—(i) A declaration that the metal is required to cover orders; (ii) a declaration that in the case of applications for virgin metal full allowance has been made for the expected intake of scrap; (iii) the usual purchase order on the Directorate of Non-ferrous Metals, giving details of specification, delivery, etc., required, or a statement that the applicant intends to purchase from a stockist. This means that the condition—suspended on June 1—that applications for licences had to be accompanied by a signed declaration that the metal was required to cover orders is now re-imposed. The period of validity of the licences remains unaltered. Additional charges will be made on orders booked for forward delivery.

Orders for copper and zinc will not be accepted for delivery more than six months after the end of the month of order, or for lead for more than the period of the quota (at present three months) under the rationing scheme. Sales for delivery in any one calendar month will be limited to a quantity which does not exceed, or does not substantially exceed, the customer's normal monthly consumption.